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**Abstract**

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;

- national progress in addressing the 5 ERA priorities;

- the progress at Member State level towards achieving the Innovation Union;

- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);

- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.

The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

## ACKNOWLEDGMENTS AND FURTHER INFORMATION

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). [ERAWATCH](#) is a joint initiative of the European Commission's [Directorate General for Research and Innovation](#) and [Joint Research Centre](#).

The Country Report 2013 builds on and updates the 2012 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of Inger Midtkandal (JRC-SEVILLA) from JRC-IPTS. The contributions and comments from DG-RTD are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the [ERAWATCH website](#). Comments on this report are welcome and should be addressed to [jrc-ipts-erawatch-helpdesk@ec.europa.eu](mailto:jrc-ipts-erawatch-helpdesk@ec.europa.eu).

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## EXECUTIVE SUMMARY

At the political level, the responsibility for research is organised according to the “sector principle”. Several ministries allocate sizable resources to research that are related to the sectors under their respective responsibilities. However, the Ministry of Education and Research is the largest source of government research funds and is responsible for the inter-ministerial coordination of the national research policy and the government’s overall research funding. At the strategic level, i.e. below the ministerial level, three agencies, the Research Council of Norway (RCN), Innovation Norway and the Industrial Development Corporation of Norway (SIVA), are the main institutions for implementing the research and innovation policies of the government. The performance of RDI in Norway is divided between the Industrial, the Higher Education and the Institute sectors. The Norwegian research and innovation system is characterised by a multitude of actors at the political and performing level, while at the strategic level there are fewer actors and more overall coordination.

Norway participates in the European Union’s single market via the European Economic Area (EEA) agreement. Total spending on research and development in Norway was 1.66% of GDP in 2012, a figure that has remained relatively stable over the last 20 years. Norway performs below average in terms of R&D spending as share of GDP both as compared with the EU and the OECD. The reason for this relatively moderate performance lies to a large degree in the fact that Norway has one of the highest GDPs in the world. If measured against GDP per capita a different picture emerges, with Norway being among the group of countries with the highest spending on R&D.

The R&D expenditure of the Norwegian business sector (BERD) is relatively low, and increasing industrial R&D has been perceived as a key challenge for some time. Although there have been some positive developments in recent years, BERD as percentage of GDP remains significantly lower than the EU average (0.87% compared to 1.3% in EU27).

Norway is part of the Innovation Union Scoreboard group of “moderate innovators”, with a level of innovation performance and average annual growth in innovation that is below the EU-27 average.

In an international perspective, Norway’s main strengths are its human resources, with a very high degree of full time researchers in the labour force and a strong dynamic of new doctoral graduates. Norway is among the OECD countries with the highest educational level in the population and the number of employees with higher education qualifications in both the private and the public sector is increasing considerably.

In March 2013, the government presented to the parliament a new white paper on research (Report no. 18 (2012-2013)), titled “Long-Term Perspectives - Knowledge Provides Opportunity”. The government’s assessment is that the research performed in Norway is of good quality and that the system works properly, although there is potential for improvement in a number of areas.

In the white paper, the authorities pledge to continue to increase research funding in the years ahead and build a research system that is based on predictability, transparency and on a long-term perspective. Research policy will remain oriented towards five strategic goals, where the

research will contribute to meeting global challenges, particularly environmental and climate change; good health and less social inequality in health and health care services; research-based social policy and professional practice in welfare services; a knowledge-based economy; and economic development in the areas of food, marine industries, tourism, energy, environment, biotechnology, ICT and new materials/nanotechnology.

The following are the key challenges of the Norwegian research and innovation system as identified in this report:

- Shortage of science and engineering (S&E) students – The number of new S&E graduates is far below the EU average.
- Increasing industrial R&D – The R&D intensity of the Norwegian business sector is relatively low.
- Knowledge-intensive services, license and patents – Norway performs below the EU average in terms of patents applications and medium- and high-tech product exports as a percentage of total product exports.
- Increasing internationalisation and mobility – There is potential for further internationalisation in parts of the research system and an increase in researcher's mobility, especially outgoing mobility.
- Increasing the number of PhD fellows – The number of PhD candidates has almost doubled over the last ten years, but Norway still lags behind some neighbouring countries such as Sweden and Finland.

Norwegian policymakers are working actively to develop policy and measures to address these challenges. They have all been addressed in the latest white papers on research and intellectual property rights. Among the key areas in need of improvement, identified in the white paper on research, is promotion of research in industry and strengthening of internationalisation in the research system.

Overall, Norway can be said to be well aligned to the commitments of the Innovation Union. Norway has a high share of researchers in the total active population and the global financial crisis has had negligible impact on the labour market demand and supply balance. The high share of foreign researchers that either work in Norway or are seeking jobs is an indication that Norway has a relatively open and attractive research system. As mentioned earlier outgoing mobility of researchers could be increased. Norway is an active participant in the European Strategy for Research Infrastructure (ESRI).

Norway has a variety of funding measures targeting a large variety of priorities and actors in the innovation system. Access to private venture capital is, however, limited. A variety of schemes exist that are clearly defined for SMEs. Norwegian research policy has a clear and strong regional element but since Norway does not receive structural funds, the national authorities currently have no ambition to relate to or develop a National Research and Innovation Strategy for Smart Specialisation (RIS3). Some regions have started to take initiatives to increase knowledge about the concept and the County of Nordland is in the process of developing a regional RIS3

Internationalization of research and innovation is a strategic policy priority of the Norwegian authorities. This is confirmed by various strategy and policy papers, including the recent white paper on research. One of the main action points in the international strategy of the Research Council of Norway (RCN) is to focus greater attention on international cooperation and



researcher's mobility in internal grant application review processes and to encourage Norwegian researchers to participate in international research through stays abroad.

Norway has participated actively in the development of the European Research Area (ERA) and the Norwegian policy mix can generally be said to be well aligned with the ERA pillars and objectives. Aligning national priorities with EU policy objectives is an explicit policy of the Norwegian government, as set out in several recent policy documents.

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## 1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

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Norway is a small and open economy. It has a population of 5.077.789 (October 2013), or about one per cent of the EU-27 population. Norway participates in the European Union's single market via the European Economic Area (EEA) agreement. Norway has the second highest GDP per capita in Europe, with the high GDP partly explaining the low R&D level intensity. The Norwegian GDP per capita in 2012 was 96% above the EU average. Real GDP growth increased in Norway over the last three years, from 0.5% in 2010 to 2.9% in 2012 (as compared to -0.4 in the EU27 in 2012). In 2012, the total R&D expenditure was 1.66% of Norwegian GDP, below the EU average of 2.06%. The objective of the Norwegian authorities is that by 2030, total R&D expenditure will have reached 3% of GDP. The aim is also to increase government spending on R&D to 1% of GDP, but without any specific timeframe.

The Norwegian research and innovation system is characterised by a multitude of actors at the political and performing level, while at the strategic level there are fewer actors and more overall coordination (NIFU, 2013a).

The national government plays an important role in the Norwegian R&D system. At the political level, the responsibility for research is organised according to the "sector principle". Several ministries allocate sizable resources to research that are related to the sectors under their respective responsibilities. Research appropriations are widely distributed among several ministries, while the Ministry of Education and Research is the largest source of government research funds and is responsible for the inter-ministerial coordination of national research policy and the government's overall research funding. The Minister of Education and Research heads the Government's Research Board, of which the most research oriented ministries are permanent members and which is the primary institutional setting within the government for coordinating the overall R&D policy. The authority and influence of the Board within the sector-based funding structure is, however, limited.

Other ministries - in addition to the Ministry of Education and Research - that allocate large funds to research include, inter alia, the ministries for Trade, Industry and Fisheries, Health and Care Services, Petroleum and Energy, Climate and Environment and Agriculture and Food.. The Ministry of Health and Care Services has, over a number of years, considerably increased its appropriations for research and has now surpassed the Ministry of Trade, Industry and Fisheries as the second-largest research ministry.

The overall responsibility for Norway's innovation policy resides with the Ministry of Trade, Industry and Fisheries. The general innovation policy is less institutionalised and is of more recent origin than the research and development (R&D) policies. While a need was identified in the early 2000s for a more integrated innovation policy across ministries and across the private and public sectors, the first white paper on innovation dates from 2009. The Ministry of Health and Care Services has launched strategies for innovation in the health and care sectors, emphasising both improvements in the quality of services and business opportunities.

The Ministry of Local Government and Modernisation has the overall responsibility for innovation policy at the regional level (there are 19 county administrations or fylker). In recent



years, the counties have taken on a more central role in initiating, funding and implementing regional innovation policies; they were explicitly given this responsibility in a 2007 reform and offered tools to implement research, development and innovation (RDI) strategies at the regional level. One key role of the counties is to administer the Regional Research Funds that were established in 2010 to promote regional innovation and development by fostering R&D within the priority areas of the seven respective regions.

At the strategic level, i.e. below the ministerial level, three agencies are the main institutions for implementing the research and innovation policies of the government. The Research Council of Norway (RCN) acts as the only operational research policy agency in Norway. In addition to funding research, the RCN has the mandate to advise the government on research policy and to create communication and coordination arenas for the actors in research, industry and government. The Ministry of Research and Education and the Ministry of Trade, Industry and Fisheries are the most important contributors to the RCN's budget, which was approximately €980m (NOK7.67b) in 2013. Innovation Norway and the Industrial Development Corporation of Norway (SIVA) are the primary public institutions providing support for innovation. Innovation Norway provides programmes and services with the objective of promoting innovation at the regional and national level, with a particular focus on small and medium sized companies. SIVA is involved in the provision of science parks, incubators and services mainly to start-up firms. Both the RCN and Innovation Norway are assigned with tasks that in many other countries would be spread between a number of different institutions (NIFU, 2013a).

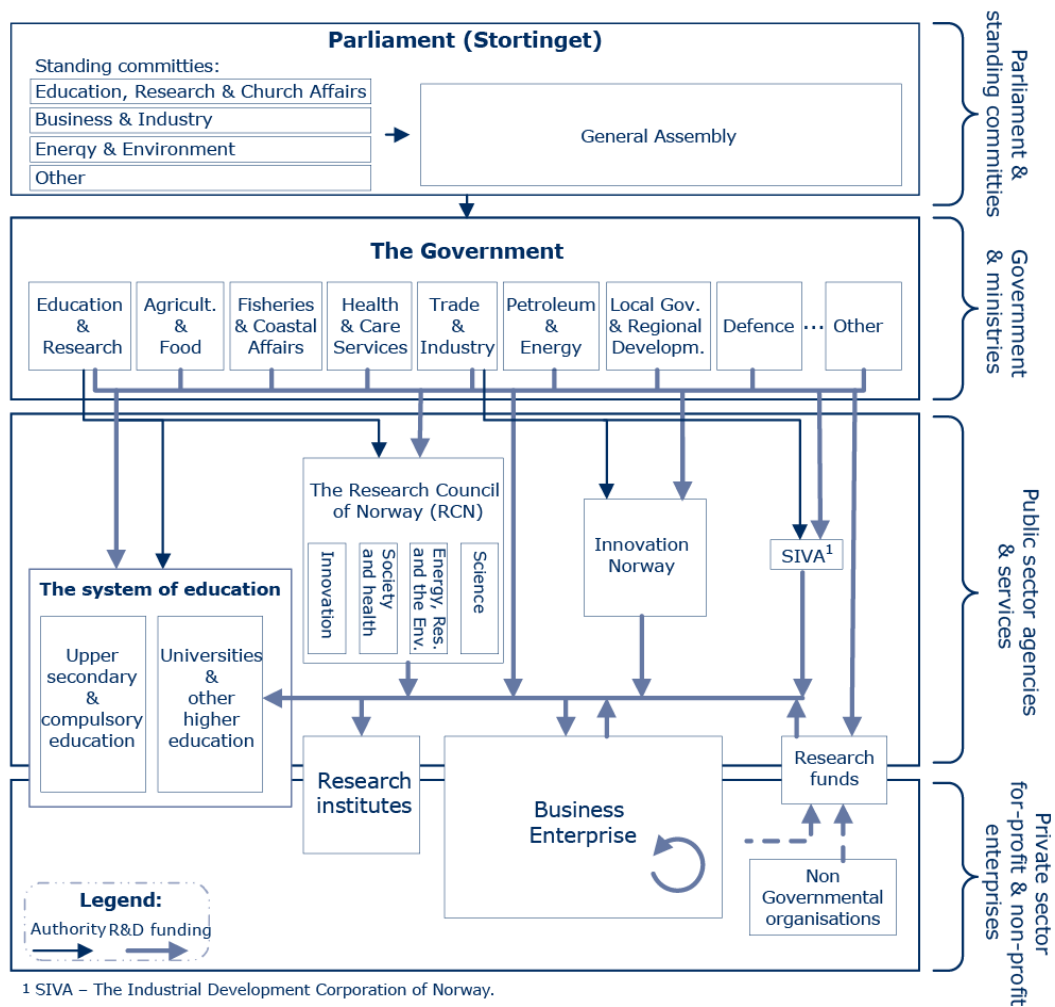
The performance of RDI in Norway is divided between the Industrial, the Higher Education and the Institute sector<sup>1</sup>, where there is a multitude of different actors. Universities carry out the lion's share of research in the Norwegian higher education system (over 80%). A relatively high share of R&D is performed by the Institute sector which covers several different type of institutions, including both privately and publicly funded research institutes. A major player is SINTEF which is one of the largest research institutes in Northern Europe. There are relatively few R&D intensive companies in Norway. Some of the largest R&D performers are in the oil and gas sector, with the state owned petroleum company Statoil being the second largest R&D performer in 2012. Only about one-half of R&D expenditure in the oil and gas sector is performed in-house. More generally, a comparatively larger part of R&D is performed outside the companies themselves, which reflects the key role of research institutes within the business sector.

Norway's multiannual R&D strategies are defined in periodical (every four years) white papers or so-called Reports to the Norwegian Parliament (Stortinget). Public funding for R&D is provided within the framework of an annual budget. In the latest white paper on research, published in 2013 (Long-term perspectives – knowledge provides opportunity), the government stresses the importance of ensuring and increasing the long-range perspective, predictability and transparency with regard to national investments in R&D and higher education. The aim is therefore to launch an effort to develop a long-term national plan, setting out political priorities for research and higher education in a 10-year perspective. It is anticipated that the first long-term national plan will be presented in 2014. The government also pledges in the white paper to increase allocations to research in the coming years in order to realise the strategic objectives of Norwegian research policy and to encourage industry to increase its R&D investments.

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<sup>1</sup> The Industrial sector excludes business-oriented research institutes, which are included in the Institute sector, but covers R&D performers in the government and private non-profit sector (NIFU, 2010).

Figure 1: Overview of the Norwegian system of education, research and innovation.



Source: NIFU, 2013a

## 2. RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

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### 2.1. National economic and political context

In October 2013, a new minority right-wing government took office in Norway following eight years of a centre-left government. A broad consensus exists between main political parties in Norway about the basic outlines of the research and innovation system and the new government is not expected to change policies in a major way. However, some differences do exist. The new government has for example signalled that it intends to put more emphasis on stimulating RDI in the private sector. And unlike the previous government which had no specific timeline as to when spending on R&D should reach 3% of GDP, the new government aims to achieve this target by 2030 (NIFU, 2013a).

The Norwegian economy has weathered the global financial and economic crisis well. Supported by high oil prices and low interest rates, the economy has grown steadily since late 2009. Despite a moderate increase, the unemployment rate has remained low, seen from an international context, throughout the crisis (3.3% in October 2013). In 2012 GDP grew by 2.9% and is forecasted to grow by 2.6% in 2013 (Eurostat, 2013). Total spending on research and development was 1.66% of GDP in 2012. This figure has remained relatively stable during the last 20 years. Annual growth in R&D spending since 2007 has been less than 1%, which is a somewhat slower annual growth than during the years leading up to the crisis (NIFU, 2013a). The global economic crisis has not had any significant impact on public R&D funding in Norway.

Nearly a quarter of the national R&D effort is included in the priority area of global challenges, comprising mainly energy-related research. This is followed by the key priority areas of Health, Food and Marine research (NIFU, 2013a). This emphasis is in part linked to the importance of natural resources such as oil and gas, fish and minerals in the Norwegian economy. The development of petroleum-related industrial activities in the engineering and services sectors has had a particularly strong influence on the economic and R&D specialisation patterns of Norway.

### 2.2. Funding trends

#### 2.2.1. Funding flows

Following an economic contraction in 2009, the Norwegian economy returned to growth in 2010 and has expanded every year since, with a growth rate of 2.9% in 2012 (against a -0.4% rate in the EU27).

The Barcelona target of total national expenditure (GERD) on R&D reaching 3% of GDP was officially adopted by the Norwegian government in 2005. The new government that took office in October 2013 confirmed the target and introduced a timeline, setting the goal of reaching the

target by 2030. It thus remains a long-term goal and so far there has been no clear trend towards the achievement of the target. Total R&D expenditure in Norway has remained stable over the last three years, and lower than that of the EU (1.66% against 2.06% in the EU27 in 2012). During the period of 2007-2011, average real growth in R&D expenditure was on average close to 1% of GDP (NIFU, 2013a).

As regards government expenditure on R&D (GBOARD), the ambition is that this should reach 1% of GDP. No specific timeframe has been set for the achievement of this goal. With around €550<sup>2</sup> (NOK4300) in R&D expenditure per capita, Norway has one of the highest per capita expenditures on R&D in the OECD countries. In 2012 government R&D spending as share of GDP was 0.78% (Eurostat, 2013). There has been a considerable real growth in government spending on R&D since 2000, on average an increase of 3.7% annually. However, due to a significant increase in GDP this has not resulted in any major increase in R&D spending as share of GDP (NIFU, 2013a).

Norway performs below the EU average in terms of business sector expenditure (BERD) on R&D as a share of GDP as well as in terms of R&D performed by the business sector. Norwegian BERD was lower than the EU average in 2012 (0.85% as opposed to 1.26% of GDP), although the shortfall is more than made up for by Norway's significantly higher GDP per capita. The sector carried out R&D totalling €2.7b (NOK20.07b) in 2011, around 44% of the total R&D costs. The higher education sector (including university hospitals) stood for 32% of R&D expenditure and the institutional sector 26%. Over a ten-year period (2001-2011), the biggest growth in R&D expenditure has been in the higher education sector, followed by the institutional sector, while the business sector has had the lowest growth. The business sector's share of performed R&D remained at the same level in 2011 as in 2007, or at around 52% (NIFU, 2013a).

The biggest other source of funding is funding from abroad, which has remained stable at around 8% of R&D expenditure since 2005. Close to 20% of the funding from abroad comes from the EU framework programmes. Other sources of R&D funding are negligible in Norway and made up only 2-4% of R&D expenditure during the period of 2001-2011 (NIFU, 2013a).

No information exists at national level of breakdown of funds allocated to research and innovation on the one hand and innovation funding on the other. Most of the funding for innovation is channelled from the Ministry of Trade, Industry and Fisheries. This ministry is the largest contributor of funds to Innovation Norway and the second largest contributor of funds to the RCN. R&D funding is mainly provided by the Ministry of Education and Research, which is the biggest contributor of funding to the RCN. In 2012 around 72% of funds allocated by Innovation Norway went to innovation-related activities (Innovation Norway, 2013). In that same year €192m (NOK 1.5bn), or around 22% of RCN's operating budget was devoted to innovation (RCN, 2013a).

Table 1. Basic indicators for R&D investments

	2009	2010	2011	2012	EU (2012) **
GDP growth rate	-1.6	0.5	1.3	2.9	-0.4
GERD (% of GDP)	1.76	1.68	1.65	1.66	2.06 (e)

<sup>2</sup> Exchange rate NOK per 1 EUR: Annual average for 2013, NOK 7.81

GERD (euro per capita)	999.9	1,099.6	1,185	1,291.5	525.8 (e)
GBAORD - Total R&D appropriations (€ million)	2,363	2,721	2,883	3,099	90,344 (e)
R&D funded by Business Enterprise Sector (% of GDP)	0.91	0.86	0.86	0.87	1.3
R&D performed by HEIs (% of GERD)	32	32	31	31	24
R&D performed by Government Sector (% of GERD)	16	16	16	16	12
R&D performed by Business Enterprise Sector (% of GERD)	52	51	52	52	63
Share of competitive vs. institutional public funding for R&D	n/a	n/a	n/a	n/a	
Venture Capital as % of GDP (Eurostat table code tin00141)	0.090	0.055	0.055	0.025	0.021 (EU15)
Employment in high- and medium-high-technology manufacturing sectors as share of total employment (Eurostat table code tin00141)	n/a	n/a	n/a	n/a	5.4
Employment in knowledge-intensive service sectors as share of total employment (Eurostat table code tsc00012)	n/a	n/a	n/a	n/a	49.3
Turnover from Innovation as % of total turnover (Eurostat table code tsdec340)	n/a	n/a	n/a	n/a	n/a

(e) - EUROSTAT estimate

Data Source: EUROSTAT, December 2013

## 2.2.2. Funding mechanisms

### 2.2.2.1 Competitive vs. institutional public funding

Around 80% of government funding for R&D in Higher Education Institutions (HEIs) is channelled directly from the Ministry of Education and Research, mainly as institutional funding. The majority of these funds are given as block funding. The rest is distributed on the basis of reported student performance, research performance, and strategic research considerations. Since 2003 a new funding structure has been in place for these funds, which consists of three core components:

- basic funds which are block funding without detailed specifications of its use. This component initially amounted to about 60% of institutional funding (on average for all HEIs), but has decreased somewhat;
- a teaching component, in which funds are distributed on the basis of reported student performance; this component initially amounted to about one-quarter of institutional funding and has increased somewhat;
- a research component, which amounts to about 15% of institutional funding. This component is subdivided into two parts, a performance-based part and a strategic part, within which earmarked funds are allocated to specific institutions for positions for PhD students and for scientific equipment.

The ratio between core funding and competitive funding has remained largely constant in recent years. However, the changes in the structure of core funds indicate a shift to more emphasis on performance- and strategy-based core funding of research by HEIs.

An elaborate and transparent system for registering and reporting input to the performance-based parts of the system has been developed. The Norwegian Agency for Quality Assurance in Education (NOKUT) is an independent government agency that contributes towards quality assurance and enhancement in higher education and tertiary vocational education. NOKUT

conducts quality controls and stimulates the quality development of educational provision at Norwegian universities, higher education colleges and colleges of tertiary vocational education.

Since 1993 institutional funding of research institutes has taken place according to guidelines for government funding, which apply to 51 research institutes. These institutions are entitled to core funding from the government, generally channelled through the RCN. The division of core funding between different institutes, amounts to approximately 23% for social science institutes, 18% for environment and development institutes, 13% for fisheries and agriculture institutes and 12% for industry institutes.

For most institutes, total institutional funding has until 2013 consisted of two parts, block funds and funds for strategic, institutional research programmes. While the former are allocated on an incremental, historical basis, funds for strategic programmes have, in most cases, been distributed by the RCN on the basis of peer-reviewed applications. Institutes have, to some extent, competed among themselves within designated groups of institutions. A new system for institutional funding of research institutes was implemented in 2009. Part of the institutional funding is now based on performance-related benchmarks such as reviewed publications, competitive research funds (RCN and international funding) and PhD students funded by the institutions themselves.

Competitive R&D funding is mainly channelled through the Research Council of Norway (RCN). Central RCN funding schemes include a national competitive arena for researcher-initiated basic research projects (FRIPRO) and the so-called Large-scale programmes covering strategic areas of national research policies.

The RCN runs the scheme FRIPRO for responsive funding of researcher-initiated basic research projects. The scheme is funded by appropriations from the Ministry of Research and Education and corresponds to about 15% of annual budget of the RCN. Appropriations for FRIPRO will increase in 2014 after having been stagnant in 2013. Both 2011 and 2013 saw a significant budget increase for FRIPRO. In 2013, about €67m (NOK527m) were allocated to 106 independent projects. Around 10% of applications submitted under the scheme were successful. Funds are distributed on the basis of peer review by four expert committees.

### **2.2.2.2 Government direct vs indirect R&D funding<sup>3</sup>**

The SkatteFUNN tax incentive scheme is the main tool for indirect funding of R&D. The scheme constitutes a major shift in the policy mix in the Norwegian system and represents a large share of the public support for R&D in Norwegian firms. Its objective is to increase private R&D expenditure and to enhance value creation in trade and industry. Under the scheme, all enterprises that are subject to taxation in Norway are eligible for a tax deduction for R&D expenses in approved projects. The eligibility of projects is contingent on approval by RCN based on whether the project falls within the definitions of an R&D activity. It is notable that the firms that are not in a position to pay tax because they have no profits are nevertheless eligible for a cash refund.

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<sup>3</sup> Government direct R&D funding includes grants, loans and procurement. Government indirect R&D funding includes tax incentives such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.



The balance between direct R&D funding and indirect funding in the form of tax incentives has remained largely the same since 2009, when the SkatteFUNN scheme was expanded. In 2012, government direct expenditure on R&D was €3,099m, increasing by nearly 14% since 2010, while during the same period the total budgeted tax deductions through SkatteFUNN for active projects grew from €217m (NOK1.7bn) to €243(NOK1.9bn), or by almost 12% (RCN, 2013b). A greater political emphasis on using tax incentives to stimulate research and innovation can be observed following the election of a new right-wing coalition in 2013. The new government has signalled that the scheme will benefit from an increase in budget appropriations. No single programme covers the entire value chain, but there are programmes such as FRIPRO for fundamental research and FORNY2020 for projects conducted at publicly-funded research institutions, which facilitate commercialisation of R&D results.

### 2.2.3 Thematic versus generic funding

Both thematic and generic funding measures are in place and are seen as important research and innovation policy tools. The Large-scale Programmes represent a key component of the Research Council's efforts to satisfy the objectives regarding priority thematic and technology areas. At present the RCN administers seven programmes under the Large-scale Programme initiative. These programmes have been developed in a dialogue between the research establishment, industry and the public administration, and extend across various sectors and value chains. A large share of the overall number of support measures target environment, energy and health. The additional three new Centres for Environmental friendly energy research (CEER) established in 2011 and increased appropriations for the ENERGIX and CLIMIT schemes for renewable energies and climate continue to add considerably to the overall budget and for the strategic domains within energy, climate and the environment.

Generic funding is mainly represented by the RCN's BIA user-driven research programme, which has no thematic restrictions. This broad-based programme supports high-quality R&D projects with good business and socio-economic potential. Established in 2006, BIA is targeted at industry and had in 2011 a budget of approximately €45m (NOK 355m)<sup>4</sup>. Other prominent programmes with no thematic restrictions are the Industrial PhD programme and the SFI scheme promoting innovation by supporting long-term research through close cooperation between R&D intensive companies and research institutions. The total budget allocation from the RCN for the 14 centres of the SFI-scheme amount to €143m (NOK1.1bn) over the live-span of eight years.

Approximately half of the research efforts funded by the RCN are organised under the auspices of research programmes. Out of this share, the Large-scale Programmes received 38% of the funds during the period of 2005-2011<sup>5</sup> and the BIA programme 31%, with no major shift in the funding balance between these two programmes in the last three years of that period.

### 2.2.4 Innovation Funding

No special trend or strategy can be discerned in terms of a national change towards more focus on funding of R&I instead of pure R&D funding. Both funding of research and innovation are important national policy priorities, but as described in section 2.2.1 above the ministries and

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<sup>4</sup> Latest available figure from the Research Council of Norway.

<sup>5</sup> Ibid.



implementing agencies play a different role and have their own specificities when it comes to funding of research and innovation. No recent systematic analysis or study assessing the balance between research funding and innovation funding exists. Information in the annual reports of the main funding agencies can give an indication of the proportions of funds allocated by the agency in question to research and innovation (see section 2.2.1), without providing any clear trend at national level.

### **2.3. Research and Innovation system changes**

The Ministry of Local Government and Regional Development has the overall responsibility for innovation policy at the regional level (there are 19 county administrations, or fylker). In recent years, the counties have taken on a more central role in initiating, funding and implementing regional innovation policies; in 2007, the counties were explicitly given this responsibility and offered tools to implement RDI strategies at the regional level. One key role for the counties is to administer the Regional Research Funds that were established in 2010 to promote regional innovation and regional development by fostering R&D within the priority areas of the seven respective regions.

No other major changes in the structure of the research and innovation system can be reported.

### **2.4. Recent Policy developments**

In March 2013, the government presented to the parliament a new white paper on research (Report no. 18 (2012-2013)), titled “Long-Term Perspectives - Knowledge Provides Opportunity”. The government’s assessment is that the research performed in Norway is of good quality and that the system works properly, but that the following areas are a potential for improvement:

- further improve quality and create more research and education in the international top class research;
- better prepare for innovation in the research system and promote the development of industry and the public sector;
- strengthen internationalisation and build a good relationship between national and international instruments;
- improve cooperation in the development and use of knowledge.

According to the white paper, the government will continue to increase research funding in the years ahead and build a research system that is based on predictability, transparency and a long-term perspective. The government will prepare a long-term plan for research and higher education that will take a ten-year perspective and will be reviewed every four years. The plan will be a tool to target efforts in the areas where Norway has a strategic advantage and to meet future needs for knowledge in key areas. The first 10-year plan is expected to be presented in 2014.

The white paper further develops the previous white paper (Report no. 30 (2008-2009)) “Climate of Research”. Research policy will remain oriented towards five strategic goals, where research will contribute to meeting global challenges, particularly environmental and climate change; good health and less social inequality in health and health care services; research-based social policy and professional practice in welfare services; a knowledge-based economy; and economic

development in the areas of food, marine industries, tourism, energy, environment, biotechnology, ICT and new materials/nanotechnology.

In March 2013, the government presented to parliament a white paper (Report no. 28 (2012-2013)) titled “Digital Agenda for Norway – ICT growth and value creation”. In this white paper the government outlines the main goals of a national ICT-policy and identifies some specific priority areas, adopting a long-term perspective, as far ahead as 2020. The target groups are business and industry, interest groups, decision-makers in the public and private sectors, academia, the R&D community, volunteers, and civil society. The government’s primary goal is that Norwegian society take full advantage of the value creation and innovation opportunities that ICT and the internet offer and identify those areas of society that have the greatest potential for further development and that will face fundamental changes. It wants Norway to be one of the leading markets for ICT-based services, to be a society whose citizens are online and whose market players know they can reach the entire population with their digital offerings.

In April 2013, the government presented to the parliament a white paper on intellectual property rights (IPR) and innovation (Report no. 28 (2012-2013)), “Unike idear, store verdier”. The white paper contains an analysis of the current status and trends in the field of IPR and presents a policy that can contribute to clear and strategic use of IPR in the Norwegian business sector. Many Norwegian businesses, especially SMEs, make little use of IPR in developing their business concepts and strategies. This is largely due to a lack of awareness, competencies and training. The white paper proposes measures to increase guidance and training for businesses, improve awareness and competencies, combat counterfeiting and piracy and develop further the activities and role of the Norwegian Industrial Property Office.

In May 2013, the government announced it wished to take part as a full member of the new EU framework programme for research and innovation, Horizon 2020. Norway’s overall contribution to Horizon 2020 is expected to total close to €2bn (NOK 16bn) over a period which may extend to 2025. While many Norwegian researchers are already well established in European cooperative networks, participation is still considered to be too narrow. A strategy is likely to be put forward on how to better take advantage of the opportunities inherent in EU research cooperation and to establish clear priorities for cooperation (Ministry of Education and Research, 2013).

The government announced in May 2013 that it will increase allocations to the SkatteFUNN scheme by roughly €12.8m (NOK 100m) in 2014. The government will set out the details of the proposed increase to the scheme’s budgetary framework in the National Budget for 2014, presented in autumn 2013. Enhancing the SkatteFUNN scheme is part of a national growth package being proposed to prevent the further division of Norwegian industry into petroleum-based vs. land-based activity.

With the 2013 allocation of €64m (NOK 505m), the RCN has awarded a total of €192m (NOK 1.5bn) for scientific equipment since the Ministry of Education and Research first earmarked allocations for research infrastructure in 2009. The allocation will give Norway 16 new, modern and essential research infrastructures in the form of laboratories, databases and scientific equipment. The infrastructure funding is intended to better equip Norway to attract talented researchers and win funding under the EU framework programme and forms part of the government’s plan to increase investment in research and add importance to a long-term perspective in research policy.

The RCN’s Industrial PhD programme builds long-term expertise in companies through increased research efforts. Companies can apply for support for three to four years, for an

employee who wants to obtain a PhD. The support is limited to 50 per cent of the grant rate. In 2013, the RCN will fund approximately 30 new PhD projects. The funds are not provided as a personal scholarship for the candidate but as project support to the company. There is a number of criteria that must be met; among them is a binding agreement with a degree rewarding institution. The objective of the programme is to increase the long-term development of competence in business and scientist recruitment and to achieve a higher appreciation of the interaction between business and academia.

In 2012, the RCN adopted a new policy document for innovation in the public sector. The objective is that the public sector becomes better at taking initiatives and at using research to bring forward new ideas and better solutions. The policy is expected to form a basis for a long-term initiative, including a public sector PhD, verification projects in municipal sector and innovation related to services and technology.

## **2.5. National Reform Programme 2013 and R&I**

Norway is not a member of the EU and does therefore not participate in the National Reform Programme.

## **2.6. Recent evaluations, consultations, foresight exercises**

The Ministry of Education and Research invited stakeholders from business enterprises, the public sector and research and higher education sectors to give their input to the government's work on the first long-term plan for research and higher education. The government's 2013 research white paper (Long-term Perspectives – Knowledge Provides Opportunities) recommended setting up such a long-term plan. The plan will contain priorities for research and higher education in 10-year perspective. The deadline for input in the stakeholder's consultation was 15 October 2013.

The annual report on the condition ("Tilstandsrapport") and evolution of the Norwegian higher education sector since 2003 was published by the Ministry of Education and Research in May 2013. With regard to research in higher education institutions, the report found a number of positive developments, including a 60% increase in the number of scientific publications and a doubling of the number of new PhDs since 2003. In 2012, 1461 new PhDs were completed and 35% of the PhD students were foreign nationals.

In 2012 the Ministry of Education and Research commissioned an evaluation, carried out by Damvad Norge, on the system of basic funding of the Norwegian Research Institutes. The report did not recommend any major changes to the funding system but proposed a simplification of the main funding indicators. In July 2013 the Ministry of Education and Research adopted new guidelines for the basic funding of the Research Institutes based on the recommendations in the evaluation.

One of the most important evaluation in 2012, carried out on behalf of the Ministry of Education and Research, was the evaluation of the Research Council of Norway. The report concluded that the RCN has developed positively over the last 10 years. The report shows that the RCN achieves good results in the Norwegian research and innovation system and helps to improve the quality of Norwegian research. The RCN has developed important changes to the system, particularly the establishment of centres of excellence and large applications, and it has

shown significant improvements in the quality and efficiency of its proceedings. In addition, the evaluation shows that the RCN has gained legitimacy in research institutions and with consumers in general and has affected the institutions' priorities. Though the main conclusion is positive, the evaluation does suggest that the RCN must balance the public sector's needs and Norway's strategic needs. The evaluation also identifies areas for improvement:

- The RCN must continue to strengthen the quality of research;
- The RCN should establish mechanisms for risk-averse in basic and applied research. There is a need for instruments that create innovation and change;
- The RCN should systematically use evaluations and bold future studies inter alia as a part of its cycle in various research programs;
- There is a need for clearer strategic choices in the internationalisation of Norwegian research.

The Norwegian PhD education system was evaluated in 2012 by the Nordic Institute for Studies in Innovation, Research and Education (NIFU). The overall assessment of the report is that Norway has a high quality PhD education system. Compared to many other countries in the current economic climate, the system is well-funded, well-organised, offers good working and learning conditions for PhD candidates, and offers good career prospects. Some issues, however, have not yet been addressed. For example, there is no systematic evaluation of the postgraduate careers of doctoral holders. The evaluation also notes that the demands for a reduction in the time-to-degree and the increased focus on generic training could possibly affect negatively the research results and training (NIFU, 2012a).

The Program for Regional R&D and Innovation (VRI) was evaluated in 2012 by Oxford Research. The overall results show that the VRI provides a substantial contribution to the development of regional research and innovation systems and thereby improves the prospects for innovation in companies.

The 12 regional research institutes in Norway were evaluated in 2012 by a committee established by the RCN. The main conclusion was that many of the regional research institutes are too small and should merge or cooperate more closely with university colleges or other research institutes in order to strengthen their organisational framework and improve research quality.

As part of the background analysis for the government's white paper on higher education and research published in 2013, NIFU carried out a study commissioned by the Norwegian Ministry of Education and Research, titled "Markets for applied research – a comparative analysis of R&D systems in five countries". The main objective of the study was to identify strengths and weaknesses of the Norwegian system for applied research by comparing it to the systems in Sweden, Finland, Denmark and the Netherlands. The report confirms the strong role that research institutes play in Norway. The country has an open system for research services and performs rather well in the competition for EU funding, although all the other countries compared to in this study have higher success rates in the EU framework programme. Norwegian performance in this area is largely due to the research institutes, while higher education institutions seem less active on the European arena than is the case in the other countries.

The report also notes that industry renewal seems to be a particular concern for the Norwegian system and that the industry structure is relatively low R&D-intensive. The study recommends policies to increase R&D and absorptive capacity in firms and an increase in the basic funding of

research institutes so that they are better equipped to provide firms with more forward looking and high risk research.

## **2.7. Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)**

Since Norway does not receive structural funds, the national authorities in Norway currently have no ambition to relate to S3 or to develop a national S3 strategy. Some regions have started to take initiatives to increase knowledge about the concept of smart specialisation and one county, Nordland, is the first and to date only Norwegian region that is registered at the S3 platform at JRC-IPTS in Seville. The Nordland County Council, in partnership with regional policy and R&D institutions, has started working on an S3 strategy based on partnership and the lessons learned from the VRI Programme funded by the RCN. An informal network of partnerships has been established in Nordland and other Norwegian and Nordic regions that are working with S3 strategies.

### 3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

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*This chapter is aimed to assess the performance of the national Research and innovation system and identify the structural challenges faced by the national innovation system.*

#### 3.1 National Research and Innovation policy

Norway participates in the European Union's single market via the European Economic Area (EEA) agreement. Total spending on research and development in Norway was 1.66% of GDP in 2012, a figure has remained relatively stable over the last 20 years. Norway performs below average in terms of R&D spending as share of GDP both as compared with the EU and the OECD. The reason for this relatively moderate performance lies to a large degree in the fact that Norway has one of the highest GDPs in the world. Thus if measured against GDP per capita, Norway belongs to a group of countries with the highest spending on R&D.

In an international perspective, Norway's main strengths are its human resources, with a very high degree of full time researchers in the labour force and a strong dynamic of new doctoral graduates. Norway is among the OECD countries with the highest educational level in the population and the number of employees with higher education qualifications in both the private and the public sector is increasing considerably.

Norwegian researchers have significantly increased their publication in the past decade. Since the mid-1990s Norway has seen the largest rise in impact with a current level around 9% above the world average. A larger proportion of Norwegian scientific publications are highly cited than the EU average, according to the Innovation Union Competitiveness Report 2011. This development can be seen in light of the introduction in 2004 of a funding model for Norwegian higher education institutions that links institutional funding in part to publications. The level of Norwegian patenting internationally is, however, below the EU average for PCT and EPO applications (Innovation Union Scoreboard, 2013).

The number of international scientific co-publications per million population was 1483 in 2011. This number is lower than Sweden's 1604, Denmark's 1692 and Iceland's 1692, but higher than Finland's 1323. However, even though Norway performs lower than most of its Nordic neighbours its performance is much higher than the EU average (European Commission, 2013b).

Large-scale investments are currently being allocated to research infrastructure in Norway to address the estimated investment needs of approximately €1.47b (NOK11b) for the 2008-2017 period (excluding operating costs). These investments derive from a national strategy for research infrastructure and the resulting earmarking of funding from the Research and Innovation Fund (Research Council of Norway, 2012a).

Over the last nine years, Norway has been part of the European Innovation Scoreboard (now the Innovation Union Scoreboard) group of "moderate innovators" with a level of innovation performance and average annual growth in innovation that is below the EU-27 average.



Norway's position as moderate innovator remains unchanged in the Innovation Union Scoreboard (IUS) 2013, although its innovation performance comes close to that of the Innovation followers. Despite remaining below the EU-27 innovation average, Norway continues to experience relatively strong economic growth and low unemployment and to be at the forefront of current economic development (European Commission, 2013a).

The relative strengths of the Norwegian system are present in the fields of Human resources and Open, excellent and attractive research systems. Growth performance in these two fields is well above average. High growth is observed for Community trademarks. The relative weaknesses are in Firm investments and Economic effects. A strong decline is observed for Venture capital investments and Community designs. (European Commission, 2013b)

Table 2

HUMAN RESOURCES	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	1.9
Percentage population aged 25-64 having completed tertiary education	48.8
Open, excellent and attractive research systems	
International scientific co-publications per million population	1483
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	12.17
Finance and support	
R&D expenditure in the public sector as % of GDP	0.84
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)	n/a
FIRM ACTIVITIES	
R&D expenditure in the business sector as % of GDP	0.86
Venture capital and seed capital as % of GDP	0.069
Linkages & entrepreneurship	
Public-private co-publications per million population	115.9
Intellectual assets	
PCT patents applications per billion GDP (in PPSE)	3.61
PCT patents applications in societal challenges per billion GDP (in PPSE) (climate change mitigation; health)	0.80
OUTPUTS	
Economic effects	
Medium and high-tech product exports as % total product exports	16.70*
Knowledge-intensive services exports as % total service exports	49.4
License and patent revenues from abroad as % of GDP	0.17

\*2010



## 3.2 Structural challenges of the national R&I system

The main structural challenges facing the Norwegian R&I system are outlined below:

### **Shortage of science and engineering graduates**

The number of new S&E graduates is far below the EU average. In the European Innovation Scoreboard for 2009 Norway ranks 19th and lies below the neighbouring countries such as Sweden, Denmark and Finland. The number of new science and engineering graduates (S&E) is far below the EU average (European Commission, 2007). The share of female S&E graduates (28% in 2007) is particularly low; it is the lowest among the Nordic countries and is substantially lower than other OECD countries.

The average annual growth between 2000 and 2008 in tertiary graduates in science and engineering stood at 0.2 percent in Norway, which was below the EU average of 3.3 for the same period. On this indicator, Norway performs significantly worse than its Nordic neighbours. The average annual growth for Sweden was 1.5, for Denmark 1.7, for Finland 6.2 and for Iceland 4.0 (European Commission, 2011).

The low level of unemployed human resources in science and technology as a percentage of total unemployment is noteworthy. In 2009, the level was 1.3% in Norway, whereas the average for the EU was 3.6% (Innovation Union Competitiveness Report, 2011). This situation would indicate that there is a good match between job opportunities and S&T graduates. However, the debates highlight that the shortage of S&T engineers is a problem for the Norwegian economy and that this problem may only become more acute in the future.

### **Increasing industrial R&D**

The R&D intensity of the Norwegian business sector is relatively low, and for years, increasing industrial R&D has been seen as a key challenge. Although there has been some positive development, with BERD as percentage of GDP slightly increasing from 0.82 in 2006 to 0.91 in 2009, it declined again in 2010 to 0.86% (in large part due to strong GDP growth), and it is clear that the R&D intensity of the business sector remains remarkably low – 0.87 in 2012. The BERD/GDP ratio is far below the EU average, which was 1.3% in 2012 (Eurostat, 2013).

### **Knowledge-intensive services, licenses and patents**

Norway is currently performing lower in terms of patents applications and medium- and high-tech product exports as a percentage of total product exports than the EU27 average. The same situation can be seen with the licence and patent revenues from abroad, which are 33% lower than the EU27 average. The knowledge-intensive services exports as a percentage of total service exports are, however, slightly higher than the EU27 average. Norway is listed as number 14 (out of 144) in terms of its protection of IPR in the Global Competitiveness Report 2012-2013 (World Economic Forum, 2013). In 2009, 101 patent applications per million population in Norway were registered, while in Sweden, Denmark and Finland, these numbers were 332, 243 and 216, respectively.

## Increasing internationalisation and mobility

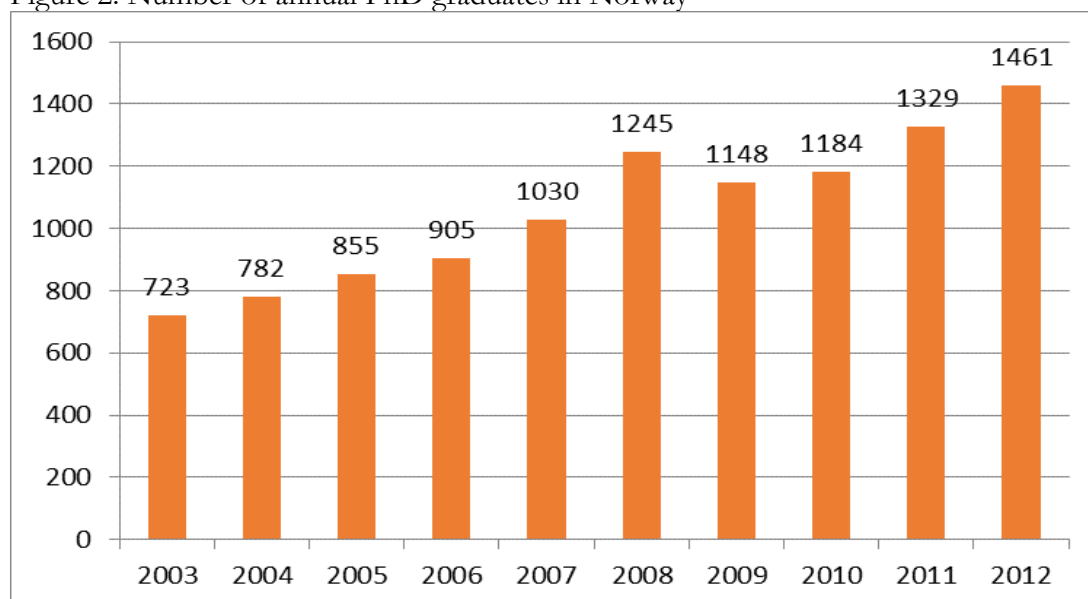
While there are indications that international mobility has been increasing in the past few years, no recent studies exist that give a complete overview of the actual volume of mobility among Norwegian researchers. There is a large knowledge gap regarding mobility in the private sector. Despite this, there seems to be a wide consensus amongst policymakers that there is a potential for further increasing international mobility, especially outgoing mobility of Norwegian researchers (NordForsk, unpublished report). The authorities acknowledge that outgoing mobility is low and have stressed, in a recent white paper, the need to improve incentives for research mobility, proposing specific measures in that regard (Ministry of Education and Research, 2013). In the same white paper, one of the main areas where improvement is needed is the strengthening of international cooperation in parts of the research system.

## Increasing the number of PhD fellows

The number of PhD candidates has almost doubled over the last ten years, though Norway still lags behind some neighbouring countries such as Sweden and Finland. In the recent evaluation of the PhD education system in Norway, it has been noted that the growth in PhD candidate numbers has been accommodated without a substantial growth in academic positions (NIFU, 2012a). There is a need to increase the number of PhD fellows in the area of science and technology (Ministry of Education and Research, 2013).

Although there have been positive developments in the PhD education system, it also faces challenges and emerging issues that need to be addressed. Completion rates and time-to-degree are not regarded as satisfactory in several fields of science and still fall short of government targets. Progress has been made, however, in time to completion in certain fields of science, notably the humanities, whereas technology and agricultural sciences show opposite tendencies. Another challenge is the relatively high age of PhD graduates, which has not declined significantly over time (NIFU, 2012a).

Figure 2: Number of annual PhD graduates in Norway



(based on the data from [www.nifu.no](http://www.nifu.no); 2013)

### 3.3. Meeting structural challenges

A point of departure for assessing the Norwegian policy mix is, inter alia, the comprehensive evaluation by the OECD in 2008, which concluded that Norway has a well-balanced and efficient set of R&D and innovation policies. Evaluations with generally positive conclusions regarding of major policy instruments, such as the SkatteFUNN scheme, the IFU/OFU scheme, and various centre schemes at different stages in their development, indicate that these instruments are generally effective and well managed. A consequence of the sector-based system both in R&D and innovation policies, is that the policy mix is relatively complex and in regular need of simplification and coordination. The organisational simplification at the intermediate, strategic level through the merger of previous research councils and the organisations for innovation and industry support has not resolved these issues, partly due to the undiminished role of the sector principle at the governmental/political level. Because the issue is hardly addressed at the governmental level, it is to a large degree regarded as an issue for intra-organisational coordination and simplification within, in particular, the RCN and Innovation Norway (Erawatch, 2012).

#### **Shortage of science and engineering graduates**

There has been a large focus on this challenge in Norway for a number of years and the issue is pervasive in policy debates and documents. The students' interest in science and technology (S&T) subjects and careers, in particular at the secondary level but recently also in tertiary education, has increased as a consequence of campaigns and the general attention paid to the issue. Several measures target the position of scientific and technological subjects in secondary education as part of a "Strategy for a Joint Promotion of Mathematics, Science and Technology", which has been in operation and continually updated since 2002.

In 2011, Norwegian mathematics was evaluated by an international committee commissioned by the RCN. The committee proposed a number of measures for improving the quality of mathematical research in Norway. As a follow-up, the RCN commissioned a new national committee to give advice on how to turn the recommendations of the international committee into realistic actions. These follow-up measures were published in a report in 2012, where the main recommendation was that an "increase in funds for mathematical research and education is urgently needed to ensure that in the future the R&D capabilities underpinning Norway's industry are adequately served." Other recommendations included measures to increase mobility through the creation of national research networks and cross-institutional educational systems, make extra funding available for female mathematicians and fund adjunct professorships to rectify the gender imbalance in mathematics research (Research Council of Norway, 2012b).

The Industrial PhD scheme of the RCN can be seen, at least partly, as a measure to increase S&T graduates. It provides companies with the opportunity to enhance their research expertise. Since the start of the scheme in 2008, almost 180 PhD projects have been financed in total, and 30 new projects are anticipated in 2013.

#### **Increasing industrial R&D**

For over a decade, Norwegian policy makers have increasingly recognised that the low level of industrial R&D should be seen against the backdrop of the country's industrial structure, which is characterized by a high share of raw material-based activities that are knowledge-intensive, but not R&D intensive. As noted in the 2011 Innovation Union Competitiveness Report, the

Norwegian economy is to a large extent characterised by resource-based industries, which score low on the R&D intensiveness indicator. In regard to the important petroleum sector, the report stresses that “the high profitability of companies (...) means that the ratio of R&D investments as percentage of turnover is low, despite corporate spending on R&D to a competitive level” (European Commission, 2011). The petroleum sector along with other resource-based and export-oriented sectors have high productivity and are highly knowledge-intensive because they make extensive and efficient use of highly advanced, research-based technologies, stimulated by such factors as the openness of the export sectors to global competition. While the heightened political awareness of the peculiarities of the Norwegian industrial structure appears to have contributed to a drop in the level of concern over the R&D intensity of the Norwegian business sector, increasing industrial R&D remains a central policy objective.

Norway has a number of policy measures whose objective is to support R&D in companies. The overall public support for industrial R&D is relatively high in Norway, and the mix of instruments has remained largely stable for at least a decade. The evaluation of the SkatteFUNN tax deduction scheme published in 2008 points to the effectiveness of the measure in terms of leveraging more R&D activity in small businesses with low R&D intensity. However, targeting SMEs, the SkatteFUNN scheme has not had, and could not in itself have, significant effect on overall BERD, which is for the most part performed by large companies. The instruments targeting these companies, e.g. the BIA Scheme, have remained stable although they have been reorganised and “de-sectorised” (Erawatch, 2012).

Despite these measures - which are all generally recognised as being appropriate and effective - private R&D spending remains low compared to other European countries. This indicates that the objective of increasing industrial R&D expenditure cannot be achieved without comprehensive, structural changes in the Norwegian economy. Hence, the issue of the level of private investments in R&D must partly be reframed as an issue of which developments in the industrial structure will prove to be viable over the longer term.

Stimulating graduates to undertake S&T subjects and increasing R&D activity in private business is considered crucial for the ability of the Norwegian economy to remain innovative and competitive in the future. Another important factor is to support new knowledge-based start-up companies in the growth and commercialisation phase. This support is foremost provided through traditional schemes such as grant schemes for start-ups, investment funds, science parks, business gardens and knowledge parks.

### **Knowledge-intensive services, licenses and patents**

The Norwegian government published in 2013 a white paper on Intellectual Property Rights (IPR) with focus on strengthening training and developing guidance in the field of IPR. The white paper contains an analysis of the current status and trends in the field of IPR and presents a policy that can contribute to a clear and strategic use of IPR in the Norwegian business sector (see further section 4.2 below).

In the state budget for 2013, the government allocated €1.14m (NOK8.5m) to initiatives on intellectual property rights, of which €0.6m (NOK4.5m) were designated for the establishment of an appeals committee for IPR. A separate appeals body will make the processing of complaints simpler and less formal than bringing it before the courts.

## **Increasing internationalisation and mobility**

The three latest white papers on research give high priority to the internationalisation of research, including researcher mobility (Ministry of Education and Research, 2004, 2009, 2013). Cooperation with EU research programmes and harmonisation with ERA processes are especially important.

The white paper on research Climate for Research (Report no. 30 (2008- 2009)) states that Norway should be actively engaged in following up the European Partnership for Researchers (EPR), as described in the Communication from the Commission to the Council and the European Parliament of May 2008, and that it should develop a national action plan on human resources and mobility that mirrors the national action plans developed by the EU Member States. Subsequently, a Norwegian action plan was drafted for the period 2009-2010. The document presents the status of and/or proposed measures within the four action lines of the partnership, giving priority to action line 3 (Attractive employment and working conditions, including gender issues) and action line 4 (Enhancing the training and skills of European researchers, including inter-sectoral mobility) (NordForsk, unpublished).

Another policy measure is the strategy for strengthening Norway's cooperation in the ERA, presented by the Ministry of Education and Research in 2008. A concrete measure that was highlighted in the strategy and later introduced, is the top-up funding available for participants in Marie Skłodowska Curie scheme. The rationale behind this measure is to increase the persistent low number of Norwegian participants in these actions (Ministry of Education and Research, 2013).

Norway has officially signed on to the terms of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers, in order to better harmonise working conditions for researchers and improve the conditions for increased researcher recruitment and mobility. Most of the principles of the charter are established practice in most Norwegian institutions, and both the Norwegian Association of Higher Education Institutions (UHR) and the Research Council have adhered to the principles since 2006.

The Norwegian Centres of Excellence scheme established in 2003 is considered by the RCN as a successful measure for strengthening internationalisation in general and for promoting the recruitment of researchers with an international background in particular. Around 20% of the academic staff working at the centres are foreign citizens.

Another measure promoting the inflow of researchers is the YGGDRASIL mobility programme that offers grants to highly qualified international PhD students and younger researchers in connection with research visits in Norway. The programme seeks to make Norway an attractive research destination for highly qualified international PhD students and younger researchers.

In addition it should be mentioned that Norway's participation in the Bologna Process and the Quality Reform initiated in 2003 are central processes that have broadened the international dimension of universities and higher education institutions (NordForsk, unpublished).

## **Increasing the number of PhD fellows**

The increase of PhD fellows in the last ten years and the relative high international quality of the PhD programmes has largely been due to the effort of the higher education institutions in developing the quality of their programmes and generous public financing (Ministry of Education and Research, 2013). Increasing further the number of PhDs and improving quality,



however, remains a government policy priority. A number of proposals to achieve this were outlined in an evaluation carried out by NIFU on behalf of the Ministry of Education and Research in 2012 (NIFU, 2012a) and endorsed in the government's white paper on research in 2013.

In the evaluation carried out by NIFU, it was pointed out that in terms of the quality of research and training processes, offering enough high quality PhD courses remains a big challenge in many HEIs and cooperation between the many, relatively small, PhD programmes and HEIs in the provision of PhD courses is strongly encouraged. Supervision is considered to be a crucial issue and efforts to increase the professional development and training of supervisors are recommended. HEIs are also recommended to take steps to acquire more knowledge about the careers of their doctoral degree holders (NIFU, 2012a).

The PhD programmes have effectively become measures to increase internationalisation. In Norway, about 33% of PhD graduates are not Norwegian citizens, and in the areas of natural sciences and technology 73% of PhD programme units report having a majority of international PhD applicants. This development has been welcomed by the authorities as enriching for the research community. However, both the NIFU evaluation and the government point out that an effort is needed to better integrate the foreign students into the research community.

A concrete example of a successful cooperation between the private and public sector in increasing PhD graduates and improving training and skills in industry, is the Industrial PhD scheme managed by the RCN. In 2011 and 2012, the annual budget was approximately € 5.15m (NOK 38.5m). Since the start of the scheme in 2008, almost 180 PhD projects have been financed in total, and 30 new projects are anticipated in 2013.

In order to better connect research to innovation in the public sector, the government, in its most recent white paper on research, has proposed the establishment of a PhD for the public sector, along similar lines as the Industrial PhD (Ministry of Education and Research, 2013)

Table 3

Challenges	Policy measures/actions addressing the challenge <sup>6</sup>	Assessment in terms of appropriateness, efficiency and effectiveness
<b>Shortage of science and engineering graduates</b>	Strategy for a Joint Promotion of Mathematics, Science and Technology; Evaluation of research in mathematics and follow-up plan; Industry PhD scheme.	Norwegian policymakers have for long addressed the challenge of an insufficient number of science and engineering graduates. Initiatives, such as awareness-raising campaigns and a persistent policy attention on the issues seem to have led to increased interest to choose S&T subjects amongst students. It is however being recognized that the measures have not been effective enough.
<b>Increasing industrial R&amp;D</b>	R&D tax credit scheme; Grant scheme for start-ups; State Investment Fund; science parks; knowledge parks; business gardens, renewed programme for commercialisation of research results (FORNY2020); strengthening of seed and venture capital investments.	The SkatteFUNN scheme is most effective for small businesses, in companies where education levels among the workforce are relatively low, and in companies with low R&D intensity. The scheme has, however, not prevented the share of total R&D funding by domestic firms from declining.

<sup>6</sup> Changes in the legislation and other initiatives not necessarily related with funding are also included.

<b>Knowledge-intensive services, licenses and patents</b>	Increased funding in 2013 for IPR initiatives; Legislative changes – establishing an appeals body for IPR.	Too early to judge whether measures proposed in recent white paper and legislative changes will be effective.
<b>Increasing internationalisation and mobility</b>	Norwegian centres of excellence; Top-up grants for participants in the Marie Skłodowska Curie scheme.	There are indications that international mobility has been increasing in the past few years, which suggests that policy measures have been effective. There is, however, lack of recent studies giving complete overview of mobility, especially outgoing. It is too early to judge whether measures proposed in recent white paper and strategy papers will be effective.
<b>Increasing the number of PhD fellows</b>	HEI's internal efforts and high public funding; Industry PhD.	Measures have been effective in increasing the number of PhD fellows, improving quality of PhD programs and attracting international PhD students. Industry PhD scheme has increased the number of PhD fellow and appears to contribute to increased research and expertise in business enterprises.



## 4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

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### 4.1. Strengthening the knowledge base and reducing fragmentation

#### Promoting excellence in education and skills development

The share of researchers of the total active population is substantially higher in Norway compared to EU 27. In 2011 there were 5.5 full-time equivalent researchers in Norway per 1000 inhabitants, a small increase since 2007.

In 2011, approximately 65.000 persons were involved in R&D in Norway. Of these, 46.000 (or 70%), were researchers, technicians or other employees with at least five years of higher education. The corresponding numbers for 2007 were 6.000 and 4.000. The largest increase was related to PhDs and researcher positions at the health trusts. According to the Labour force survey of Statistics Norway, 38% of the labour force in 2012 had a higher education degree (Statistics Norway, 2013). The demand for PhD graduates on the labour market is generally high and a very small minority is registered as unemployed (Ministry of Education and Research, 2013a). There are reasons to believe that the global financial crisis has had little impact on the labour market demand and supply balance for researchers, as the impact of the crisis has been negligible in Norway and employment has remained high.

Limited data is available on in- and outgoing mobility of researchers in Norway, especially outgoing mobility. According to a study by NIFU, there were 5.400 foreign national researchers working in Norway in 2007. There are strong indications that the number of foreign researchers in Norway is increasing. The share of foreign doctoral graduates has increased from 10% in the early 1990s to 35% in 2012. Out of a total of 1461 PhD-candidates in 2012, 507 were foreign nationals. The share of foreign doctoral graduates is highest in natural and technological sciences and in agriculture (NIFU, 2012a). Around half of the foreign PhD candidates come from other European countries and around half of all the foreign PhD candidates choose to stay and enter the labour market in Norway after completing their degree (NIFU, 2013a).

The high share of foreign researchers that either work in Norway or are seeking jobs is an indication that Norway has a relatively open and attractive research system. Other factors such as a well organized labour market, low unemployment and high living standards also play a major role.

Data on outgoing mobility is scarce but evaluations that have been carried out in the past seem to indicate that outgoing mobility among Norwegian researchers is relatively low. The authorities acknowledge that outgoing mobility is low and have stressed, in the latest white paper on research, the need to improve incentives for research mobility, proposing specific measures in that regard (Ministry of Education and Research, 2013).

In relation to the 2003 Quality Reform, some major changes were introduced to Norwegian Higher Education. The Quality Reform adopted a degree structure, grading system and a quality

assurance system in line with the Bologna Process. The reform also saw the establishment of a quality assurance agency, NOKUT, and a call for all study programmes to become more oriented towards international student mobility. HEIs were also accorded greater institutional autonomy and the funding of both teaching and research in HEIs was progressively made more performance based. The Ministry of Education and Research issued in late 2013 a call for proposals on evaluating the quality of higher education in Norway. One of the main objectives is to assess whether the objectives of the 2003 Quality Reform have been met.

Norway is among the countries in the OECD that have the highest national expenditure on higher education. Norway is in the higher echelons in terms of share of the population that has attained higher education (48% of 25-34 year-olds) and in terms of high entry rate into university-level education (75%). Norway is, however, below the OECD average when it comes to successful completion of a tertiary degree as ratio of entry (59%) (OECD, 2013). Three Norwegian Universities are ranked among the 200-300 top universities in the world, according to the Times Higher Education World University Rankings for 2012-13 (Times Higher Education, 2012).

Norway has not implemented the EU recommendations on a Scientific Visa. However, from 1 January 2010 a new Immigration Act came into force in Norway. The new Act simplifies registration procedures for EU/EEA nationals and makes it easier for skilled workers from countries outside the EU/EEA to apply for employment in Norway.

In Norway, all researchers, including early-stage researchers (PhD students and post-docs) are post-graduate employees. They are paid accordingly, pay tax and enjoy full social security rights. Thus, Norway already complies largely with the terms of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.

In total, 18 Norwegian higher education and research institutions have signed the Charter and Code (C&C) and six have implemented it. A study published in 2008 by the Higher Education Council showed that Norwegian research institutes comply to a large degree with the principles of the C&C. The C&C and Norwegian laws, regulations and practice are similar in general. There is, however, room for improvement in areas such as access to career advice, career development strategy and evaluation/appraisal systems (see Euaxess.no).

Since 2004 entrepreneurship in education and training has been a prioritized area in Norwegian educational policy. Entrepreneurship has been used actively at some schools, university colleges and universities for a long time, and over the last few years there has been a significant increase in various types of entrepreneurship education. According to a survey by NIFU, about half of all Norwegian HEIs offered entrepreneurial programs in 2010 (NIFU, 2012b). It was estimated that approximately 3000 students participated in around 135 entrepreneurship education programmes during the autumn semester of 2010. This suggested that around 1.4% of students enrolled in Norwegian HEIs in the autumn semester of 2010 participated in entrepreneurship education.

Most of the more comprehensive entrepreneurship education programmes found, across all levels, were offered in the field of economics and business administration, followed by the field of natural science and technology. This suggests that there may be potential to further develop entrepreneurial education in many subject fields. This potential is partly related to the need to make entrepreneurship education of some sort available in the fields in which such education is currently absent as well as to further develop programs that foster high-growth entrepreneurship in subject areas where entrepreneurship education is currently limited (NIFU, 2012b).

In 2012, the government published an Action Plan with the view of strengthening the quality and the scope of entrepreneurship education and training at all levels and in all areas of the education system. The objective is that Norway will be a leading force internationally when it comes to entrepreneurship in education and training. The Action Plan includes measures such as invitation of applications for funds developing programmes of study in entrepreneurship and innovation in HEIs, applications for funds for developing new programmes of study in intellectual property rights and measures to make entrepreneurship in the Industrial PhD scheme more visible.

## **Research Infrastructures**

The primary objective of Norway's infrastructure policy, as set out in the new version of Tools for research – Part I (2012-2017), Norway's national strategy for research infrastructure, is to “ensure that the Norwegian research community and trade and industry have access to relevant, up-to-date infrastructure that facilitates high-calibre research, which in turn will help to solve major knowledge challenges facing society.” Another main objective is to promote Norway as an attractive partner for international research cooperation and a desirable choice when domestic and international companies are considering where to conduct their research activities (Research Council of Norway, 2012a). The national strategy is a revision of the first version of Tools for Research published in 2008, and will be revised on a regular basis in response to changes in national priorities and the needs specified by the research institutions.

The white paper “Long-term perspectives – knowledge provides opportunity”, published in 2013 sets the goal to promote the establishment of infrastructure and development of systems and the setting of a long-term plan for research infrastructure.

In 2013 the government announced that 16 new research infrastructures will receive funding from the Research Council of Norway. Among the projects are a language lab, a wave tank, a petroleum laboratory, a centre for gene sequencing and a modern medical technical laboratory. With the current allocation of €64m (NOK 505m), the RCN has awarded a total of €192m (NOK 1.5bn) for scientific equipment since the Ministry of Education and Research first earmarked allocations for research infrastructure in 2009.

The first version of the Norwegian Roadmap for Research Infrastructure was published in 2010, as one of many similar roadmaps that had been, or were in the process of being, drawn up in other countries. The roadmap presented large-scale projects of national importance that had achieved very high ranking in the first funding round in 2009. The roadmap is to be revised after each major funding announcement for research infrastructure issued by the RCN. The current roadmap encompasses 32 projects, of which 17 are now under implementation.

The Norwegian Roadmap is a direct follow-up of the Government white paper on research, Climate for Research, and is closely linked to the National Financing Initiative for Research Infrastructure which had its first call for proposals in 2009.

Norway is an active participant in the ESFRI cooperation. Norway's 2010 roadmap included six ESFRI projects, whereas the new Norwegian roadmap encompasses 12 ESFRI projects in which Norway has entered into binding agreements or has clearly signalled its desire to participate. Norwegian institutions have offered to host three of these projects.

## 4.2. Getting good ideas to market

### Improving access to finance

The main research and innovation policy and funding measures in Norway are managed by the three implementing agencies, Innovation Norway, the Research Council of Norway and SIVA. Large part of the government's resources for innovation are channelled through these agencies. The measures target a large variety of priorities and actors in the innovation system, such as universities, entrepreneurs, firms and research institutes. Some measures target specific sectors, while others are more general.

Programmes such as the industry and public R&D contracts scheme (IFO/OFU), supporting innovative firms, and the User-driven Innovation programme (BIA), targeted at industry, continue to be central for innovation funding. The programmes receive increased funding in the government budget for 2013 and 2014 (NIFU, 2013:32m). Another important measure is the SkatteFUNN R&D tax incentive scheme designed to stimulate research and development in trade and industry. Under the scheme, approved projects may receive a tax deduction of up to 20% of costs related to R&D activities. In the government's budget for 2014 the SkatteFUNN will receive a major increase of €32m (NOK 250m) in appropriations.

There exist also various public innovation funding measures for companies, including stipends to establish new companies, provision of bank guarantees and loans, investment in promising unlisted companies aiming for international growth and expansion (Investinor AS) and a seed capital scheme. The latter is a nation-wide scheme that invests in innovative businesses in an early stage of development, providing state venture capital to businesses as a loan with a risk relief element. In the last decade, venture capital is estimated to have increased to 0.21% of GDP in 2011, with an average annual growth rate of 2.4% (European Commission, 2013c). Access to private venture capital, however is limited, except for a few so-called "business angels", or informal individual investors (Nordic Innovation website, 2011).

There are therefore a variety of schemes clearly defined for enterprises, and most, if not all, are tailored to the needs of small and medium enterprises. SMEs form the majority of all enterprises in Norway, with over 99% of companies having less than 100 employees and two-thirds of employees in the private sector working in SMEs (Ministry of Trade and Industry, 2012a).

One of the main themes in the government's strategy paper on SMEs published in 2012 is to simplify rules and reduce administrative burden for Norwegian enterprises. A major goal, as outlined in the strategy, is to reduce companies' administrative costs by €1.2bn (NOK10bn) by the end of 2015. The strategy introduces 64 concrete measures that aim to improve the everyday life of Norwegian SMEs, including measures that are designed to simplify rules and regulations in a large range of fields, such as competition, tax and auditing to name a few. In 2013, the government published a "follow-up" brochure, listing the implementation status of all the 64 measures. Of the 64 measures, 23 have already been implemented while 37 are under implementation (Ministry of Trade and Industry, 2013a).

One example of good practice in Norway's effort to simplify is its ambition to be at the forefront in the world in terms of offering e-government solutions. The clearest manifestation of this ambition is the Altinn portal, which offers joint electronic solution for reporting and dialogue with business and industry. In 2009 more than 44.000 businesses chose to do their

statutory reporting through the portal. One of the measures in the government's SME strategy is to improve and strengthen the services available in Altinn on a continuing basis.

From 2010 and 2012 the three main agencies in charge of implementing and funding innovation - Innovation Norway, SIVA and the Research Council of Norway - were evaluated. The main conclusions emerging from the evaluations were largely positive and no recommendations for major reorganisations were made (see further section 2.6).

Norway has, according to a report published by the OECD in 2008, a good, solid set of instruments to support R&D and innovation. Evaluations of major policy instruments, such as the SkatteFUNN and the IFU/OFU scheme, indicate that these instruments are generally effective and well-managed. However, it has been pointed out in some of these evaluations that there is a need for simplification and alignment in the R&D and innovation policy mix due to the prominence of the sector principle in the system (Erawatch, 2011).

In the SME strategy of 2012, the authorities say they are committed to ensure that funding schemes and funding agencies are regularly evaluated (Ministry of Trade and Industry, 2013a).

### **Protect and enhance the value of intellectual property and boosting creativity**

The Norwegian Industrial Property Office (NPO) is the Norwegian national authority for processing applications for patent, trademark and design, and a centre for industrial property rights. Other agencies, like Innovation Norway, the Research Council, SIVA, Standard Norway and the Norwegian Design Council have an information and advisory role. The overall responsibility for the NPO and the regulatory framework of the policy lies with the Ministry of Trade, Industry and Fisheries. Norway has been a member of the European Patent Office and a signatory to the European Patent Convention since 2008.

The Norwegian regulatory framework is to a large degree up-to-date and in line with EEA requirements. It is therefore to a large extent harmonised with other EEA/EU countries (Ministry of Trade and Industry, 2013b).

The most recent developments in the field of intellectual property rights are the government's white paper on intellectual property rights (Report no. 28 (2012-2013), "Unike idear, store verdier") and a proposed law amendment to the parliament on the enforcement of rules protecting industrial property, both introduced in 2013. The aim of the law proposal is to strengthen the enforcement of sanctions that can be applied to interventions in industrial property rights (patents, plant variety rights, design rights and trademark rights) and thus to make it easier for copyright holders to enforce their rights.

The white paper on IPR contains an analysis of the current status and trends in the field of IPR and presents a policy that can contribute to a clear and strategic use of IPR in the Norwegian business sector. The main objective is that Norwegian businesses and public actors become better at using the value creation potential that lies in good management of intellectual property rights and values. To achieve this objective, the authorities outline six areas where they will focus their efforts:

- Link Norway to international agreements (e.g. the London Agreement on European Patents) and update rules and policies;
- Strengthen education and training in the field of intellectual property rights and values;
- Continue to strengthen and develop the Norwegian Industrial Property Office (NPO);



- Develop the overall guidance services in the field of intellectual property rights and values;
- Combat piracy and trademark counterfeiting;
- Strengthen the knowledge base for future policy development.

As regards the NPO, the white paper highlights the importance of developing and consolidating the agency in order to enable it to offer improved services to Norwegian businesses and to strengthen the cooperation between the NPO and other public agencies such as Innovation Norway, the Research Council, SIVA, Standard Norway and the Norwegian Design Council.

## **Public procurement**

The Agency for Public Management and eGovernment (Difi) works to promote innovative public procurement. In 2010 Difi received about €38.500 to engage in measures to increase public procurers' awareness and competence on innovative public procurement. In 2011 this work was continued with a grant of €90.000. The agency was overseen by the Ministry of Government Administration, Reform and Church Affairs until the new government took office in 2013 and was then transferred to Ministry of Local Government and Modernisation.

The public sector in Norway is a large buyer of goods and services. The total purchases of goods and services by the public sector amounted to about €49bn (NOK 398bn) in 2011, or 14.5% of GDP. This was an increase of 5.8% from 2010.

The underlying objective of the legislative framework around public procurement in Norway is to ensure that funds are utilized through cost-effective procurement and that the public sector, through its procurement, contributes to the development of a competitive Norwegian business sector. The rules on public procurement in Norway are to a large degree harmonised with EU rules (Ministry of Trade and Industry, 2013c).

In 2013 the government published a strategy paper on innovation in public procurement, outlining the main challenges and proposing a number of measures (Ministry of Trade and Industry, 2013c). The main objective of the strategy is to contribute to increased value creation and resource utilization through innovation in public procurement which should result in better services to citizens, increased efficiency in the public sector and a more profitable and flexible business sector. Some of the measures include using public procurement as a strategic tool in public institution development, open dialogue between public institutions and market actors, increasing R&D collaboration and strengthen the knowledge base of public procurement. The measures proposed in the strategy will be implemented during the next few years and in 2018 the overall strategy will be evaluated.

Measures have also been proposed in the government's strategy on SMEs to facilitate SME competition for public contracts, by simplifying and streamlining procurement processes.

The OFU and IFU programmes (Public and Industrial Research and Development Programmes) managed by Innovation Norway, have proved to be a successful public procurement tool. The aim of the programmes is to stimulate innovative firms and improve the quality and efficiency of public services through the acquisition of new technologies or solutions by promoting cooperation between a company and a public authority acting as a customer.

### **4.3. Working in partnership to address societal challenges**

Norwegian research policy emphasizes the importance of tackling global challenges through research and innovation. Meeting global challenges is one of the five strategic goals of the Norwegian government as stated in the two latest white papers on research (Climate for research and Long-term perspectives – knowledge provides opportunity). Particular emphasis is placed on the environment, climate change, oceans, food safety and energy research. Transnational R&D cooperation is to a large extent linked to these thematic priorities. An example is the Joint Programming Initiative (JPI) Healthy and productive seas and oceans launched in 2010 between Norwegian, Belgian and Spanish research funding agencies. Norway participates as a full member in nine of ten JPIs and as an observer in one.

So far Norwegian participation in the European Innovation Partnership (EIP) has been relatively limited, however, Norwegians are involved in 30 EIP initiatives registered on the Innovation Union website.

### **4.4. Maximising social and territorial cohesion**

Since Norway does not receive structural funds, the national authorities in Norway currently have no ambitions to relate to or develop a National Smart Specialisation Strategy. Some regions have started to take initiatives to increase knowledge about the concept and one county, Nordland, is the first and to date only Norwegian region that is registered at the S3 platform at JRC-IPTS in Seville.

The government and the parliament are politically responsible for formulating objectives and establishing the framework for Norwegian research activities. Increasingly, however, the responsibility for formulating regional R&D and innovation priorities has been devolved to the county level. Research, development and innovation have in recent years been emphasised as key factors in the effort to create strong regions. The Research Council of Norway is in the process of drawing up a regional strategy to improve its role in the regional partnerships and increase awareness of the regional dimension in programme design.

The RCN's programme for R&D and innovation in the regions (Programme for Regional R&D and Innovation - VRI) is an important contribution to the transfer of more responsibility for R&D and innovation activities to the regions. In 2007 the VRI programme was introduced, with the aim to foster innovation, knowledge development and added value through regional cooperation and a strengthened research and development effort within and for the regions. Government budget allocations to VRI have, however, decreased since 2010, partly due to the establishment of Regional Research Funds (RRF) (NFU, 2013b). The regional VRI must be seen as closely related to the establishment of the RRF's. In early 2010 Norway launched seven regional research funds which will help to bolster R&D investments nationwide and enhance research for regional innovation and development. The aim is to cultivate dynamic, competitive research communities in all 19 Norwegian counties. Seven funds covering seven regions have been operative since 2010. These funds are administered by the regional authorities in cooperation with the RCN, and each fund incorporates the strategic priorities of the counties belonging to the region that the fund covers.



## 4.5. International Scientific Cooperation

Internationalization of research and innovation is a strategic policy priority of the Norwegian authorities. This is confirmed by various strategy and policy papers, including the recent white paper on research (Ministry of Education and Research, 2013).

One of the main action points in the RCN's international strategy is to focus greater attention on international cooperation and researcher's mobility in internal grant application review processes and to encourage Norwegian researchers to participate in international research through stays abroad and visits by guest researchers to institutions in Norway (Research Council of Norway, 2010a).

Transatlantic cooperation holds a prominent place in the RCN's international strategy. The US and Canada are among the countries with which research cooperation is considered to be of special national priority. The focus of the RCN is on broad-based cooperation within many disciplines and subject areas in transatlantic research and innovation cooperation. The objective is to enhance research quality, address global challenges and promote integration into well-functioning systems for research-based innovation. Norway has a long tradition of scientific and technological cooperation with the USA and Canada and the USA is regarded by the RCN as the single most important country for Norway's international research cooperation. It is considered of vital importance that Norwegian institutions maintain and strengthen their contact with counterparts in the US and Canada.

For the most part, international research cooperation, including that with the US and Canada, is incorporated into grant proposals submitted to the RCN in connection with a regular funding announcement. In addition, the RCN has launched initiatives specifically designed to strengthen research cooperation with the U.S. and Canada and a few other select countries.

The Leiv Eiriksson mobility programme aims to contribute to the long-term growth of R&D collaboration with the U.S. and Canada by allowing more Norwegian researchers and research recruits to spend time in the US or Canada, and more researchers and research recruits from these countries to spend time in Norway.

The Nordic Research Opportunity supports National Science Foundation Graduate Research Fellows who undertake stays of between two and twelve months to work with counterparts at Norwegian research institutions.

To encourage bilateral research cooperation, the RCN also provides national support for existing projects to develop new collaborative research efforts with partners in priority countries, first and foremost the US, Canada, China, Japan and India.

One example of bilateral cooperation between Norway and the US is the Fulbright programme. Since the start of the program in Norway, about 1.245 Americans and 3.341 Norwegians have been awarded a Fulbright grant. The program was originally supported exclusively by American funding, but today around 70% of the funding comes from the Norwegian Ministry of Education and Research and the Ministry of Foreign Affairs with the remainder from the US government. Each year, approximately 50 Norwegians receive grants to study, teach or conduct research in the US, and approximately 30 US citizens receive grants to do the same in Norway.

## 5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

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### 5.1. More effective national research systems

The Norwegian long-term objective on government expenditure on R&D (GBAORD) is that it should reach 1% of GDP. However, no specific timeframe has been set for the achievement of this goal. In 2012, government R&D spending as share of GDP was 0.78%, or €2,883m. Average GBAORD in the EU27 in 2012 was 0.67%. Government expenditure in R&D has increased by 14% since 2010. Since 2000 there has been a considerable real growth in government spending, on average an increase of 3.7% annually. However, due to a significant increase in GDP this has not resulted in any major increase in government R&D spending as share of GDP (NIFU, 2013a).

Norway's multiannual R&D strategies are defined in periodical (every four years) white papers or so-called Reports to the Norwegian Parliament. Public funding for R&D is provided within the framework of an annual budget. In the latest white paper on research, published in 2013 (Long-term perspectives – knowledge provides opportunity), the government stresses the importance of ensuring and increasing the long-range perspective, predictability and transparency with regard to national investments in R&D and higher education. The aim is to launch an effort to develop a long-term national plan, setting out political priorities for research and higher education in a 10-year perspective. It is anticipated that the first long-term national plan will be presented in 2014. The government also pledges in the white paper to increase allocations to research in the coming years and to encourage industry to increase its R&D investments.

About 80% of government funding for R&D in Higher Education Institutions (HEIs) is channelled from the Ministry of Education and Research, mainly as institutional funding. The remainder is distributed on the basis of reported student performance, research performance, and strategic research considerations. Part of the funding for research institutes is based on performance-related benchmarks such as reviewed publications, competitive research funds and PhD students funded by the institutions themselves. Competitive funding is mainly channelled through the Research Council of Norway (RCN). The RCN is the government's key instrument for implementing national research policy priorities. In 2012 the total RCN budget amounted to €995m (NOK7.433m), half of which was organised under research programmes. No accurate breakdown is available about the share of project funding vs. institutional funding, however, core funding for HEIs constitutes a relatively high share of funding for research. In 2009, the share was two-thirds of total R&D costs (NIFU STEP, 2010). The division between core funding and competitive funding has remained relatively constant in recent years. However, changes in the structure of core funds indicate a shift to more emphasis on performance- and strategy-based core funding of research by HEIs.

The evaluation of the RCN in 2012 showed that there have been almost no evaluations of the research institutes and very few evaluations of other institutes and centres. One of the recommendations in the evaluation, and one which is supported by the authorities in the latest white paper on research, is that the RCN should start to evaluate individual research institutes or groups of institutes in a more systematic way. The main conclusion from the evaluation of RCN was that the RCN functions satisfactorily and its services are generally considered by users as relevant and of high quality (Technopolis, 2012). The RCN has a long tradition of allocating research funds on the basis of international peer review.

## **5.2. Optimal transnational co-operation and competition**

The Ministry of Trade, Industry and Fisheries is responsible for cooperation with and management of the funding mechanisms, where the three most important players are the Research Council of Norway, Innovation Norway and SIVA. Large parts of the Ministry's resources for innovation and industrial research are channeled through these players. Such direct support comes from Innovation Norway, RCN and seed capital schemes, while indirect support from SIVA.

The white paper "Long-term perspectives – knowledge provides opportunity" outlines a goal of increasing internationalization in parts of the research system and ensure more effective coordination in the use of national and international policy and funding instruments and promote further cooperation (Ministry of Education and Research, 2013).

Project establishment support, is funded by the RCN, and up to 50% of costs for the Norwegian participants. It aims to strengthen the Norwegian international research and motivate Norwegian participation in European cooperation. The budget for 2013 is €5.38m (NOK 40.2m). Researchers from abroad should usually be affiliated with a Norwegian institution to be eligible to seek Norwegian funding. Internationalisation of research and participation in joint agenda is a priority for Norway. This explains an involvement in 10 Joint Programming Initiatives (JPI).

The RCN is actively using international peer review in its decisions. Recent evaluations have however revealed that the experts have been mostly coming from the Nordic countries. (Technopolis, 2012)

The international strategy of the RCN, supports institutions in internationalization measures to develop long-term partnerships with priority institutions 2010-2020.

The white paper "Long-term perspectives – knowledge provides opportunity" sets a goal to promote the establishment of infrastructure and development of systems and setting a long-term plan of research infrastructure. International cooperation 2010-2020, the program of the RCN aims to secure and strengthen Norwegian participation in international projects, obtain more knowledge in and outside Europe. Norway is an active participant of the ESFRI.

The strategy paper "Tools for Research" – Norway's national strategy for research infrastructure 2012-2017 has suggested to "ensure that the Norwegian research community and trade and industry have access to relevant, up-to-date infrastructure that facilitates high-caliber research, which in turn will help to solve major knowledge challenges facing society" (Research Council of Norway, 2012a) through new policies implementing. The national program Research Infrastructure (2008-2017) supports Norwegian participation in establishing research infrastructure on the ESFRI Roadmap. The budget in 2012 has reached €37.48m (NOK 280m).

## **5.3. An open labour market for researchers**

Norway can be characterized as a country with a decentralized market for researchers. Career paths of researchers are not determined centrally and higher education institutions enjoy a large degree of autonomy, for example as regards recruitment procedures. Free mobility of workers within the EU/EEA is guaranteed through Norway's membership of the European Economic Agreement (EEA).

The overall situation in terms of Open, Transparent and Merit-Based Recruitment can be described as good, although specific measures at national level are limited, partly due to the decentralized nature of recruitment procedures. Demand for PhD graduates and researchers on the labour market is generally high and there are reasons to believe that the global financial crisis has had little impact on the labour market demand and supply balance for researchers. The high share of foreign researchers that either work in Norway or are seeking jobs is an indication that Norway has a relatively open and attractive research system.

Applicants for research grants that are non-residents in Norway must as a general rule have a formal affiliation with a Norwegian institution to be eligible to seek Norwegian funding. However, some financing opportunities are specifically designed for foreign researchers and partners.

The RCN and the Ministry of Education and Research are responsible for the portal and management of the Euraxess Norway. The RCN coordinates the network. The EURAXESS Contact Points are located in various universities and research institutions.

The Ministry of Education and Research has overall responsibility for PhD training and also funds PhD scholarship positions. The RCN also funds a large number of PhD scholarship positions and has an advisory function towards the Ministry of Education and Research. The PhD degree and its regulations are based on the three level degree structure that follows from the Bologna reforms of 2002, and the European qualification framework. Within these regulatory frameworks, the HEIs can decide the detailed regulations for their PhD degrees for themselves, although they generally follow the recommended guidelines for PhD regulations adopted by the Norwegian Association of Higher Education Institutions (UHR). The term Innovative Doctoral Training or its different principles are not specifically mentioned in the recommended guidelines for PhD regulations adopted by the UHR.

In total, 18 Norwegian higher education and research institutions have signed the Charter and Code (C&C) and six have implemented it and received the HR excellence in Research logo. Each institution signs the C&C itself and is responsible for implementation. An evaluation carried out in 2008 showed that Norwegian HEIs and research institutes comply to a large degree with the principles of the C&C. The C&C and Norwegian laws, regulations and practice are similar in general and many of the principles of the C&C are regulated through various laws and regulations ([www.euraxess.no](http://www.euraxess.no)).

#### **5.4. Gender equality and gender mainstreaming in research**

Norway is among the leading countries in its efforts to achieve gender balance in research through different measures such as legislation, action plans and programs. The proportion of women participating in R&D has been growing in all sectors and types of institutions. In 2011 women accounted for 36% of the total number of researchers in Norway, compared to 29% in 2001. The proportion of women among doctoral candidates has increased significantly over time. In 2012 women accounted for almost 50% of completed doctoral degrees, compared to 20% in 1989. (NIFU, 2013a). The share of female post-doctoral graduates was also close to 50% in 2012. The main challenges lie in large differences in gender compositions between sectors (women are under-represented in science fields and over-represented in teaching-oriented and temporary jobs) and low share of women at professor level (one out of four professors are

women) as well as low share of women as researchers in the business sector (Ministry of Education and Research, 2013a).

Gender equality is implemented in legislation (according to the gender equality law all public institutions must take active steps to promote gender equality) and promoted through incentives, programmes, action plans and other specific measures. Restoration to the same position after maternity leave is guaranteed by law and females in temporary contracts have the same maternity right as those in permanent positions as long as they have been employed 6 out of the previous 10 months. Besides bearing national responsibility for research policy-related activities to analyse and develop women's and gender research and gender equality in research, the RCN is also responsible for initiating, implementing and monitoring research activities within this field. The RCN seeks to create a framework for increasing the recruitment of women in subjects with a low percentage of women and develop initiatives to boost the proportion of women in tenured academic positions. An example of an RCN programme is The Initiative on Gender Balance in Senior Positions and Research Management (BALANSE) which aims to improve the gender balance at senior level in the Norwegian research through new knowledge, learning and innovative measures. Its budget for 2013-2018 is at least €7.76m (NOK58m).

In Norway there is a law, introduced in 2003, requiring a minimum 40% women on boards, panels and committees in public limited companies, including in HEIs and research institutes. This is supported by policy activities which address gender equality and aims to strengthen the gender dimension in research programs. The result of this legislation and policies is that Norway is today in a leading position in Europe in terms of share of women on scientific boards. Women are, however, underrepresented in top-level decision-making positions in the research and university sector, but the goal of the authorities (as outlined in the latest white paper on research) is to achieve a gender balance when it comes to top-level position. The government has asked the Committee on Gender Balance in research (Kif) to come up with concrete proposals how to improve the gender balance in top position in the university sector (Ministry of Education and Research, 2013a).

## **5.5. Optimal circulation, access to and transfer of scientific knowledge including via digital ERA**

Norway is actively involved in the development of Open Access to transfer the scientific knowledge. This is stated in the latest white paper on research “Long-term perspectives – knowledge provides opportunity”. Systems such as Norwegian Open Research Archives (NORA) and Current Research Information System in Norway (CRISTin) give access to Norwegian archives and publishing, as well as present the competency profiles (CRISTin, 2013).

The white paper “Long-term perspectives – knowledge provides opportunity” defines the direction of the development of the publication access: “The Government will require that all scientific articles that are wholly or partially publicly funded must either be published as open access articles or self-archived as agreed on with the publisher. Accordingly, “all research that is wholly or partially funded through public allocations must be made openly available” (Ministry of Education and Research, 2013a).

NORA's role is to increase the proportion of publicly available scientific articles in Norway. CRISTin was established for record and promotion of the publication data and competency profiles. CRISTin negotiates licensing and consortium agreements on behalf of Norwegian research institutions. The agreements are made with suppliers of electronic resources (CRISTin, 2013).

The white paper “Long-term perspectives – knowledge provides opportunity” sets up open research and innovations instruments as a priority of the Norwegian Government. It states particularly that further development of policies that facilitate knowledge transfer will be prioritized in the coming period. (Ministry of Education and Research, 2013a).

The RCN’s programme on Commercializing R&D Results (FORNY2020) facilitates the commercialization of results from projects conducted at publicly-funded research institutions. It provides funding to newly-established companies as well as to Technology Transfer Offices (TTOs) affiliated with the research institutions.



# ANNEX 1. PERFORMANCE THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM

Feature	Assessment	Latest developments
<b>1. Importance of the research and innovation policy</b>	<p>(+) Public action in R&amp;D is designed and implemented in a strategic, coordinated and integrated framework. Research at the political level is organised according to the “sector principle”, with several ministries allocating resources to research that is related to the sectors under their respective responsibilities. The Ministry of Education and Research is the largest source of government research funds and is responsible for the inter-ministerial coordination and the government’s overall research funding.</p> <p>(+) Specific programmes are devoted to major societal challenges.</p>	(+) Increased R&D budgets are devoted to societal challenges.
<b>2. Design and implementation of research and innovation policies</b>	<p>(-) R&amp;D budget is set annually.</p> <p>Norway does not receive structural funds, the national authorities currently have no ambition to relate to or develop a National Smart Specialisation Strategy. Some regions have started to take initiatives to increase knowledge about the concept.</p>	(+) In a white paper published in 2013, the government has pledged to continue to increase research funding in the years ahead and build a research system that is based on predictability, transparency and a long-term perspective. The government will prepare a long-term plan for research and higher education that will take a ten-year perspective and will be reviewed every four years. The plan will be a tool to target efforts in the areas where Norway has a strategic advantage and to meet future needs for knowledge in key areas. The first 10-year plan is expected to be presented in 2014.
<b>3. Innovation policy</b>	(+) Implementing agencies such as Innovation Norway, SIVA and RCN actively promote the concept of innovation develop supply and demand-side policies in a consistent manner.	
<b>4. Intensity and predictability of the public investment in research and</b>	<p>(-) R&amp;D budget is set annually.</p> <p>(+) The SkatteFUNN tax incentive scheme is the main tool for indirect funding of R&amp;D. The scheme constitutes a major shift in the policy mix in the Norwegian system and</p>	(+) Authorities are committed to build a research system that is based on predictability, transparency and a long-

<b>innovation</b>	represents a large share of the public support for R&D in Norwegian firms.	term perspective, according to white paper published in 2013.  (+) Greater political emphasis on using tax incentives to stimulate research and innovation. New government has signalled that the tax-incentive scheme will benefit from a significant increase in budget appropriations in 2014.
<b>5. Excellence as a key criterion for research and education policy</b>	<p>(+) Competitive R&amp;D funding is mainly channelled through the RCN. Central RCN funding schemes include a national competitive arena for researcher-initiated basic research projects (FRIPRO) and the so-called Large-scale programmes covering strategic areas of national research policies.</p> <p>(+) HEIs and research institutes have necessary autonomy to organise their activities in the areas of education, research and innovation and apply open recruitment methods.</p> <p>(+) The share of researchers of the total active population is substantially higher in Norway compared to EU 27. In 2011 there were 5.5 full-time equivalent researchers in Norway per 1000 inhabitants. In 2011, approximately 65.000 persons were involved in R&amp;D in Norway. Of these, 46.000 (or 70%), were researchers, technicians or other employees with at least five years of higher education. 38% of the labour force in 2012 had a higher education degree. The demand for PhD graduates on the labour market is generally high and a very small minority is registered as unemployed.</p>	(+) A new system for institutional funding of research institutes was implemented in 2009. Part of the institutional funding is now based on performance-related benchmarks such as reviewed publications, competitive research funds (RCN and international funding) and PhD students funded by the institutions themselves.
<b>6. Education and training systems</b>	<p>(-) Shortage of science and engineering (S&amp;E) students – the number of new S&amp;E graduates is far below the EU average.</p> <p>(+) Since 2004 entrepreneurship in education and training has been a prioritized area in Norwegian educational policy. Entrepreneurship has been used actively at some schools, university colleges and universities for a long time, and over the last few years there has been a significant increase in various types of entrepreneurship education.</p>	<p>(+) Large focus on S&amp;E shortage in Norway for a number of years and the issue is pervasive in policy debates and documents. The students' interest in science and technology (S&amp;T) subjects and careers, in particular at the secondary level but recently also in tertiary education, has increased as a consequence of campaigns and the general attention paid to the issue.</p> <p>(+) In 2012, the government published an Action Plan with the view of strengthening the quality and the scope of entrepreneurship education and training at all levels and in all areas of the education system.</p>
<b>7. Partnerships between higher</b>	No single programme covers the entire value chain, but there are programmes such as FRIPRO for fundamental	(+) In April 2013, the government presented to

<p><b>education institutes, research centres and businesses, at regional, national and international level</b></p>	<p>research and FORNY2020 for projects conducted at publicly-funded research institutions, which facilitate commercialisation of R&amp;D results.</p> <p>(-) Many Norwegian businesses, especially SMEs, make little use of IPR in developing their business concepts and strategies.</p> <p>(+) There are therefore a variety of schemes clearly defined for enterprises, and most, if not all, are tailored to the needs of SMEs</p> <p>(-) Access to private venture capital, however is limited, except for a few so-called “business angels”, or informal individual investors.</p>	<p>the parliament a white paper on intellectual property rights. The white paper proposes measures to increase guidance and training for businesses, improve awareness and competencies, combat counterfeiting and piracy and develop further the activities and role of the Norwegian Industrial Property Office.</p> <p>(+) One of the main themes in the government’s strategy paper on SMEs published in 2012 is to simplify rules and reduce administrative burden for Norwegian enterprises.</p> <p>(+) In the last decade, venture capital is estimated to have increase to 0.21% of GDP in 2011.</p>
<p><b>8. Framework conditions promote business investment in R&amp;D, entrepreneurship and innovation</b></p>	<p>(+) Since 2004 entrepreneurship in education and training has been a prioritized area in Norwegian educational policy. Entrepreneurship has been used actively at some schools, university colleges and universities for a long time, and over the last few years there has been a significant increase in various types of entrepreneurship education.</p> <p>(-) Many Norwegian businesses, especially SMEs, make little use of IPR in developing their business concepts and strategies.</p> <p>(+) There are therefore a variety of schemes clearly defined for enterprises, and most, if not all, are tailored to the needs of SMEs</p>	<p>(+) In 2012, the government published an Action Plan with the view of strengthening the quality and the scope of entrepreneurship education and training at all levels and in all areas of the education system.</p> <p>(+) In April 2013, the government presented to the parliament a white paper on intellectual property rights. The white paper proposes measures to increase guidance and training for businesses, improve awareness and competencies, combat counterfeiting and piracy and develop further the activities and role of the Norwegian Industrial Property Office.</p> <p>(+) One of the main themes in the government’s strategy paper on SMEs published in 2012 is to simplify rules and reduce administrative burden for Norwegian enterprises.</p>
<p><b>9. Public support to research and innovation in</b></p>	<p>(+) There exist also various public innovation funding measures for companies, including stipends to establish new companies, provision of bank guarantees and loans,</p>	<p>(+) One of the main themes in the government’s strategy paper on SMEs published</p>

<p><b>businesses is simple, easy to access, and high quality</b></p>	<p>investment in promising unlisted companies aiming for international growth and expansion and a seed capital scheme.</p> <p>(+) There are therefore a variety of schemes clearly defined for enterprises, and most, if not all, are tailored to the needs of small and medium enterprises.</p> <p>(+) An example of good practice in Norway's effort to simplify is its ambition to be at the forefront in the world in terms of offering e-government solutions. The clearest manifestation of this ambition is the Altinn portal.</p>	<p>in 2012 is to simplify rules and reduce administrative burden for Norwegian enterprises. A major goal is to reduce companies' administrative costs by €1.2bn (NOK10bn) by the end of 2015.</p> <p>(+) In 2013, the government published a "follow-up" brochure, listing the implementation status of all the 64 measures. Of the 64 measures, 23 have already been implemented while 37 are under implementation.</p>
<p><b>10. The public sector itself is a driver of innovation</b></p>	<p>(+) The public sector provides incentives to stimulate innovation and active use is made of public procurement in order to improve public services. The OFU and IFU programmes (Public and Industrial Research and Development Programmes) managed by Innovation Norway, have proved to be a successful public procurement tool.</p>	<p>(+) In 2013 the government published a strategy paper on innovation in public procurement, outlining the main challenges and proposing a number of measures. Some of the measures include using public procurement as a strategic tool in public institution development, open dialogue between public institutions and market actors, increasing R&amp;D collaboration and strengthen the knowledge base of public procurement. The measures proposed in the strategy will be implemented during the next few years and in 2018 the overall strategy will be evaluated.</p> <p>(+) Measures have also been proposed in the government's strategy on SMEs to facilitate SME competition for public contracts, by simplifying and streamlining procurement processes.</p>

## ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

		Main changes	Brief assessment of progress / achievements
1	<b>Member State Strategies for Researchers' Training and Employment Conditions</b>	<p>(+) National budget for R&amp;D has increased annually.</p> <p>(-) In 2012 a new Immigration Act came into force in Norway, simplifying registration procedures for EU/EEA nationals and making it easier for skilled workers from countries outside the EU/EEA to apply for employment in Norway.</p>	<p>(+) Global financial crisis has had little impact on the labour market demand and supply balance for researchers in Norway</p> <p>(+) Research institutes comply to a large degree with the principles of the C&amp;C. The C&amp;C and Norwegian laws, regulations and practice are similar in general.</p> <p>(-) There is room for improvement in areas such as access to career advice, career development strategy and evaluation/appraisal systems.</p> <p>(-) The EU recommendations on a Scientific Visa have not been implemented.</p>
4	<b>ERA Framework</b>		
5	<b>Priority European Research Infrastructures</b>	<p>(+) Budget for science equipment has increased.</p> <p>(+) National strategy paper for research infrastructure 2012-2017, published in 2012.</p> <p>(+) National program Research Infrastructure (2008-2017) program supports Norwegian participation in establishing research infrastructure on the ESFRI Roadmap.</p>	<p>(+) Norway is an active participant in the ESFRI cooperation. Good progress towards commitment.</p>
7	<b>SME Involvement</b>	<p>(+) Government's strategy paper on SMEs published in 2012.</p>	<p>(+) Norway committed to the principles of the EU Act on SMEs</p> <p>(-) Norway will not participate in the COSME in Horizon 2020.</p> <p>(+) Main goal of national SME strategy to reduce administrative burden for SME's</p>
11	<b>Venture Capital Funds</b>	<p>(+) In the last decade, venture capital is estimated to have increased to 0.21% of GDP in 2011, with an average annual growth rate of 2.4%.</p>	<p>(+) There exist various public innovation funding measures for companies, including a seed capital scheme that invests in innovative businesses in an early stage of development, providing state venture capital to businesses as a loan with a risk relief element.</p>

			(-) Access to private venture capital, however is limited, except for a few so-called “business angels”.
13	<b>Review of the State Aid Framework</b>		(+) The provisions of the Guidelines have had little effect on RDI policy, but certain modifications have been made to ensure that funding schemes are in line with the new Guidelines. In a few cases the provisions have led to lower support than otherwise, amongst other things due to the attention given to the accumulation of support from different sources.
14	<b>EU Patent</b>		Not applicable to Norway.
15	<b>Screening of Regulatory Framework</b>	RCN, Innovation Norway and SIVA, were evaluated in 2012 and 2010.	(-) No systemic screening of regulatory framework.
17	<b>Public Procurement</b>	<p>(+) The Agency for Public Management and eGovernment (Difi) works to promote innovative public procurement. Budget for Difi was increased in 2011 to engage in measures to increase public procurers' awareness and competence on innovative public procurement.</p> <p>(+) In 2013 the government published a strategy paper on innovation in public procurement. The main objective is to contribute to increased value creation and resource utilization through innovation in public procurement which should result in better services to citizens, increased efficiency in the public sector and a more profitable and flexible business sector.</p> <p>(+) Measures have been proposed in the government's strategy on SMEs, published in 2013, to facilitate SME competition for public contracts, by simplifying and streamlining procurement processes.</p>	<p>(+) The rules on public procurement in Norway are to a large degree harmonised with EU rules (Ministry of Trade and Industry, 2013c).</p> <p>(+) The OFU and IFU programmes managed by Innovation Norway, have proved to be a successful public procurement tool. The aim of the programmes is to stimulate innovative firms and improve the quality and efficiency of public services through the acquisition of new technologies or solutions by promoting cooperation between a company and a public authority acting as a customer.</p>



20	<b>Open Access</b>	<p>(+) White paper on research published in 2013, address the issue of open access, outlining the government's policy that all articles that are partly or wholly publicly financed should, as far as possible, become openly accessible or be self-archived.</p> <p>(+) The Research Information System CRISTin - a tool for promoting open access to scientific articles – established in 2010.</p>	<p>(-) Most scientific journals are currently subscription-based.</p> <p>(+) The infrastructure for self-archiving is well developed. HEIs have either established their own digital archives or have access to the joint solutions through the open digital archiving system for academic and scientific documents, called BIBYS/Brage.</p> <p>(+) Norway is an active participant in many large ESFRI projects and some of these are aimed at increasing the share of research data, for example CESSDA and SIOS.</p> <p>(+) Norway is developing policy and instruments to improve open access.</p>
21	<b>Knowledge Transfer</b>	<p>(+) In its white paper on research, published in 2013, the government set out its policy of further strengthening cooperation between the research, higher education and innovation sectors.</p> <p>(+) Norway participates the JPI project, Healthy and productive seas and oceans, launched in 2010. One of the main goals is knowledge transfer between the research community, business and political decision-makers.</p>	<p>(+) Knowledge transfer and cooperation between the research and business sectors is widespread.</p> <p>(+) An example of successful cooperation between the research and business sectors is the Industry PhD programme.</p>
22	<b>European Knowledge Market for Patents and Licensing</b>	<p>(+) The government published in 2013 a white paper on IPR with focus on strengthening training and developing guidance. It presents a policy that can contribute to a clear and strategic use of IPR in the Norwegian business sector.</p> <p>(+) A law amendment was introduced in 2013 on the enforcement of rules protecting industrial property. Aim is to strengthen the enforcement of sanctions that can be applied to interventions in industrial property rights (patents, plant variety rights, design rights and trademark rights) and make it easier for copyright holders to enforce their rights.</p>	<p>(-) Norway is currently performing lower in terms of patents applications and medium- and high-tech product exports as a percentage of total product exports than the EU27 average. The same situation can be seen with the licence and patent revenues from abroad, which are 33% lower than the EU27 average.</p> <p>(+) Authorities are working actively towards improving performance in this field.</p>

		(+) Increased budget in 2013 for initiatives on intellectual property rights, of which a part is designated for establishment of an appeals committee for IPR. A separate appeals body is intended to make the processing of complaints simpler.	
23	<b>Safeguarding Intellectual Property Rights</b>		Information not available.
24	<b>Structural Funds and Smart Specialisation</b>		Since Norway does not receive structural funds, the national authorities currently have no ambition to relate to or develop a National Smart Specialisation Strategy.
25	<b>Post 2013 Structural Fund Programmes</b>		Not applicable to Norway.
26	<b>European Social Innovation pilot</b>		Information not available (Norway is not a member of the European Social Fund).
27	<b>Public Sector Innovation</b>	(+) The RCN adopted a policy for "Innovation in the Public Sector" in September 2012. The policy is expected to form the basis for a long term initiative, including a "Public Sector PhD" to be launched in 2014, verification projects in the municipal sector, and research and innovation related to services and technology.	(+) Innovation in the public sector will increasingly be supported through public procurement and increased training of public procurers.  (+) There is an increasing recognition of the need and the opportunities for making innovation a more integral and extensive part of policies for the production and distribution of public services. Major achievements have been made, e.g. in eGovernment and within the health and care sector.  (+) An example of good practice is the online Altinn portal, an eGovernment service for business, which is part of the Norwegian government's ambition to be at the forefront globally in eGovernment.
29	<b>European Innovation Partnerships</b>		(-) Norwegian participation in the European Innovation Partnership (EIP) has been relatively limited, however, Norwegians are involved in 30 EIP initiatives registered on the Innovation Union website.
30	<b>Integrated Policies to Attract the Best Researchers</b>	(+) White paper on research, published in 2013, addresses the issue of low outgoing mobility of Norwegian researchers and proposes measures to increase mobility.	(+) There are strong indications that the number of foreign researchers in Norway is increasing. The high share of foreign researchers that either work in Norway or are seeking jobs is an indication that Norway has a relatively open and attractive research system. Other factors such as a well organized labour market, low unemployment and high living standards also play a major role.  (-) Data on outgoing mobility is limited but evaluations indicate that outgoing mobility

			<p>among Norwegian researchers is relatively low.</p> <p>(+) Norway's scientific and technological cooperation with the USA and Canada has a long tradition, and the USA is the single most important country for Norway's international research cooperation. Other bilateral agreements have been signed with China, India and Japan.</p> <p>(+) <a href="#">The Leiv Eiriksson mobility programme</a> aims to contribute to the long-term growth of R&amp;D collaboration with the US and Canada.</p> <p>(+) An example of bilateral cooperation between Norway and the US is the Fulbright programme.</p>
31	<b>Scientific Cooperation with Third Countries</b>		<p>(+) Internationalization of research and innovation is a strategic policy priority of the Norwegian authorities. The US and Canada are among the countries with which research cooperation is considered to be of special national priority.</p> <p>(+) <a href="#">The Leiv Eiriksson mobility programme</a> aims to contribute to the long-term growth of R&amp;D collaboration with the US and Canada.</p> <p>(+) To encourage bilateral research cooperation, the RCN also provides national support for existing projects to develop new collaborative research efforts with partners in priority countries, first and foremost the US, Canada, China, Japan and India.</p> <p>(+) An example of bilateral cooperation between Norway and the US is the Fulbright programme.</p>
32	<b>Global Research Infrastructures</b>	<p>(+) Publication in 2012 of Tools for Research, a national infrastructure strategy.</p>	<p>(+) One of the main goals is that the Norwegian research community must have state-of-the-art research infrastructure at its disposal if it is to have drawing power as a partner for international research projects as well as attract new recruits and international researchers.</p> <p>(+) Government white paper on research, Climate for Research (2008-2009), emphasises the need for Norway to participate actively in international cooperation, particularly with regard to scientific equipment that is so costly to establish, operate and maintain that a single country cannot shoulder the outlay alone. Norway is involved in a number of major European infrastructures, and in the research strategy Norway is encouraged to assess on an ongoing basis whether there are other major</p>

			<p>infrastructure facilities outside of Europe that would be beneficial for Norwegian researchers.</p> <p>(+)Norway is an active participant in the ESFRI and Norway's and the current Norwegian roadmap encompasses 12 ESFRI projects in which Norway has entered into binding agreements or has clearly signalled its desire to participate.</p>
33	<b>National Programmes</b>	<b>Reform</b>	Not applicable to Norway

## ANNEX 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

ERA Priority	ERA Action	Recent changes	Assessment of progress in delivering ERA
<b>1. More effective national research systems</b>	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	<p>Latest white paper on research (Long-term perspectives – knowledge provides opportunity) sets further objectives for competitive funding.</p> <p>According to the strategy of the RCN “In the Vanguard of Research (2009 – 2014)” the objective is to improve funding instruments for researchers by distributing the funds in open national competitive arenas</p> <p>On the basis of the findings from an evaluation carried out in 2012 the government is revising in 2013 the indicators used in the performance-based system for the reallocation of core funding to the Norwegian research institutes and their relative weights.</p>	<p>(+) Central RCN funding schemes include a national competitive arena for researcher-initiated basic research projects - FRIPRO, and the so-called Large-scale programmes covering strategic areas of national research policies. Central public support schemes for public-private R&amp;D partnerships include the user-oriented research programs of RCN and the tax incentive scheme SkatteFUNN.</p> <p>(+) Focus and commitment towards enhancing competitive funding has increased.</p>
	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	No recent changes.	(+) The Research Council of Norway has been using international peer review for several decades. Conclusion of the evaluation of RCN in 2012 was that the proposals are assessed via international scientific peer review. Large part of the available funding through the RCN is open for competitive funding and the evaluation processes for allocation of funds in RCN is considered trustworthy and of good quality and consistent with good international practice among research councils

			and innovation agencies
<b>2. Optimal transnational co-operation and competition</b>	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	<p>Latest white paper on research (2013) sets up a goal to increase internationalization in parts of the research system and ensure more effective coordination in the use of national and international policy and funding instruments and promote further cooperation.</p> <p>Norway will take part as a full member in the new EU framework for research and innovation, Horizon 2020.</p> <p>Based on the international strategy of the RCN (2010), Norway will work for facilitating participation in transnational joint research programs when these address grand challenges.</p>	<p>(+) Internationalisation of research and participation in joint agenda is a priority for Norway. Norway is involved in 10 Joint Programming Initiatives (JPI). CLIMIT is one example of how a large number of national R&amp;D programs facilitate and fund joint research agendas addressing grand challenges.</p> <p>(+) Norway has participated actively in the development of ERA and the government has pledged to follow-up Norway's participation in ERA by working out a strategy for Norway's research cooperation with the EU.</p> <p>(+) Ex-post evaluations are the most commonly and systematically used evaluations in Norway</p>
	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions	No recent changes.	<p>(+) The RCN is actively using international peer review in its decisions.</p> <p>(-) A recent evaluation has shown that the experts have been mostly coming from the Nordic countries.</p> <p>(-) No information exists on specific actions or measures to introduce more international peer-review or to allow national funders to fund research evaluated by other funders.</p>
	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant	<p>Latest white paper on research (2013) stresses the importance of Norway participating actively in international research cooperation, both in and outside of Europe.</p> <p>According to the international strategy of the RCN (2010) Norwegian research institutions will receive support in internationalization measures to develop long-</p>	<p>(+) Norway implements policies to facilitate cross-border interoperability of national programs, joint definition of priorities, similar eligibility criteria, standards for proposal evaluation, funding rates and reporting requirements.</p> <p>(+) The RCN in cooperation with relevant ministries is in the process of addressing whether there are legal or other barriers to</p>



		term partnerships with priority institutions.	the cross-border interoperability of national programs to permit joint financing of actions.
Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	<p>White paper on research (2013) sets the goal to promote the establishment of infrastructure and development of systems and the setting of a long-term plan for research infrastructure.</p> <p>Primary objective of Norway's infrastructure policy (2012), is to ensure that the Norwegian research community and trade and industry have access to relevant, up-to-date infrastructure that facilitates high-calibre research.</p> <p>In 2013 the government announced 16 new research infrastructures will receive funding from the RCN. With the current allocation of €64m (NOK 505m), the RCN has awarded a total of €192m (NOK 1.5bn) for scientific equipment since 2009.</p>	<p>(+) The current Norwegian Roadmap for Research Infrastructure roadmap encompasses 32 projects, of which 17 are now under implementation.</p> <p>(+) Norway is an active participant in the ESFRI cooperation. Norway's new roadmap encompasses 12 ESFRI projects in which Norway has entered into binding agreements or has clearly signalled its desire to participate. Norway is hosting three of the projects Norwegian participation in the European infrastructure cooperation is closely aligned with national priorities.</p> <p>(+) Large-scale investments are currently being allocated to research infrastructure in Norway to address the estimated investment needs of approximately €1.47b (NOK11b) for the 2008-2017 period.</p> <p>(+) Norway is involved in large-scale joint infrastructure through ESFRI.</p>	
Action 5: Remove legal and other barriers to cross-border access to RIs	No recent changes.	<p>(+) One primary objective of Norway's strategy is to facilitate cross-border access to RIs and to promote Norway as an attractive partner for international research cooperation. Internationalisation has been a continuous aim of research policy for decades.</p> <p>(+) Strategy of the RCN encourages the systematic use of international links and mainstreaming them through the whole portfolio of RCN funding instruments.</p> <p>(+) Main element facilitating cross-border</p>	

			<p>access is the absence of obstacles of mobility for EU/EEA citizens. Norway also has a number of programs supporting exchange of researchers.</p> <p>(-) No recent assessment on quality of large national infrastructures and their openness to foreign access.</p> <p>(+) Broad consensus that research system is highly internationalised and that overall, Norway is successful in recruiting overseas PhD students, post docs and researchers.</p>
<b>ERA priority 3: An open labour market for researchers</b>	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	In the latest white paper on research (2013) the government puts emphasis on HEIs adopting a strategic and transparent recruitment policy. The issue of temporary contracts in HEI sector is addressed- The government vows to continue to monitor and follow-up the situation. Measures such as HEI action plans and economic measures may come under consideration.	<p>(+) Research and teaching posts are publicly announced - often also outside Norway. Information easily accessible and is often presented in both Norwegian and English. Recruitment procedures transparent.</p> <p>(+) Specific measures at national level are limited, partly due to the decentralized nature of recruitment procedures, but the overall situation in terms of Open, Transparent and Merit-Based Recruitment can be described as good.</p> <p>(+) Demand for PhD graduates on the labour market is generally high. Reasons to believe that the global financial crisis has had little impact on the labour market demand and supply balance for researchers. Research careers are generally regarded as open to young researchers.</p> <p>(-) University sector has a high share of temporary contracts.</p> <p>(+) High share of foreign researchers that either work in Norway or are seeking jobs is an indication that</p>

		Norway has a relatively open and attractive research system.
Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants	No recent changes.	<p>(-/+) Applicants that are non-residents in Norway must as a general rule have a formal affiliation with a Norwegian institution to be eligible to seek Norwegian funding. However, some financing opportunities are specifically designed for foreign researchers and partners.</p> <p>(+) The RCN operates a special funding scheme covering the difference between standard salaries in Norway and the EU for researchers coming to Norway.</p>
Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network	No recent changes.	(+) All job announcements are published on EURAXESS portal, and the portal offers a wealth of practical information to mobile researchers- The Contact Points provide customised assistance in matters relating to mobility of researchers. A large part of the information available is tailor-made for researchers.
Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.	No recent changes.	<p>(+) The PhD degree and its regulations are based on the three level degree structure of Bologna, and the European qualification framework. Within the regulatory framework, the HEIs can decide the detailed regulations for their PhD degrees. Generally they follow the recommended guidelines for PhD regulations adopted by the Norwegian Association of Higher Education Institutions.</p> <p>(-) The principles of Innovative Doctoral Training are not specifically mentioned in the recommended guidelines for PhD regulations.</p>
Action 5: Create an enabling framework for the implementation of the	HEIs and research institutes are encouraged to apply the principles of the	(+) In total, 18 Norwegian higher education and research institutions have

	HR Strategy for Researchers incorporating the Charter & Code	<p>C&amp;C and in the latest white paper on research (2013), and to sign agreements that oblige them to use the principles of the C&amp;C as basis for their human resource policies.</p> <p>To support the implementation of the C&amp;C, the RCN has sent invitations to HEIs to endorse the C&amp;C principles. The RCN incorporated the C&amp;C into its funding instruments and included a reference to the C&amp;C information to applicants under 'General requirements for applications', stipulating that the principles of the C&amp;C should be applied in projects funded by the Council.</p>	<p>signed the Charter and Code (C&amp;C) and six have implemented it and received the HR excellence in Research logo. HEIs and research institutes comply to a large degree with the principles of the C&amp;C. The C&amp;C and Norwegian laws, regulations and practice are similar in general and many of the principles of the C&amp;C are regulated through various laws and regulations.</p> <p>(-) There is room for improvement in areas such as access to career advice, career development strategy and evaluation/appraisal systems and some regulations may need to be amended in order to follow the C&amp;C to the letter</p>
<b>ERA priority 4: Gender equality and gender mainstreaming in research</b>	Action 1: Create a legal and policy environment and provide incentives	<p>The Initiative on Gender Balance in Senior Positions and Research Management (BALANSE) aims to improve the gender balance at senior level in the Norwegian research through new knowledge, learning and innovative measures. Its budget for 2013-2018 is at least €7.76m.</p> <p>Goal of the authorities (as outlined in the latest white paper on research (2013)) is to achieve a gender balance when it comes to top-level positions. The government has asked the Committee on Gender Balance in research (Kif) to come up with concrete proposals how to improve the gender balance in top position in the university sector.</p>	<p>(+) Gender equality is implemented in legislation and promoted through incentives, programmes, action plans and other specific measures.</p> <p>(+) Restoration to the same position after maternity leave is guaranteed by law and females in temporary contracts have the same maternity right as those in permanent positions.</p> <p>(+) Gender perspectives are to be integrated into all research activity funded by the RCN.</p> <p>(+) Norway is today in a leading position in European in terms of share of women on scientific boards.</p> <p>(-) Women are, underrepresented in top-level decision-making positions in the research and university sector.</p> <p>(+) Norway has included gender mainstreaming in its overall strategy for gender equality. The RCN has integrated an explicit</p>

			<p>gender-equality component into calls, funding announcement and programmes.</p> <p>(+) Norway is among the leading countries in its efforts to achieve gender balance in research through different measures such as legislation, action plans and programs.</p>
	<p>Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender</p>	<p>In 2010 the Ministry of Education and Research launched a three-year pilot incentive scheme aimed at increasing the percentage of women in the highest position categories in mathematics, natural science and technology subjects. This scheme was prolonged by one year (2013).</p> <p>Introduction of the BALANSE initiative in 2013 (see above).</p>	<p>(+) Incentive scheme and initiative signal progress towards action.</p>
	<p>Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating</p>	<p>No recent changes.</p>	<p>(+) Law on HEIs stipulates that both genders must be represented in committees that decide new appointments and to “the extent possible” in cases of promotion.</p>
<p><b>ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA</b></p>	<p>Action 1: Define and coordinate their policies on access to and preservation of scientific information</p>	<p>According to the white paper on research (2013) the government’s policy on Open Access is that all scientific articles that are partly or wholly publicly financed should, as far as possible, become openly accessible or self-archived. Institutional policy on self-archiving is regarded by the government as an important policy to increase open access.</p>	<p>(+) The infrastructure for self-archiving is well developed in Norway. HEIs have either established their own digital archives or have access to the joint solutions through the open digital archiving system for academic and scientific documents, called BIBYS/Brage.</p> <p>(+) The number of self-archived articles at HEIs has increased considerably in recent years and there is a strong emphasis on self-archiving in many HEIs.</p> <p>(+) Norway is actively involved in and committed to the development of Open Access. Norway also has systems such as CRISin whose responsibility is to</p>

			promote and coordinate the work on open access to scientific articles, and the Norwegian Open Research Archive (NORA).
Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	<p>The government's white paper on research (2013), establishes open research and innovations instruments as a priority area and states that further development of policies that facilitate knowledge transfer will be prioritized in the coming period.</p> <p>Programme on Commercializing R&amp;D Results (FORNY2020) facilitates the commercialization of results from projects conducted at publicly-funded research institutions and helps to bring the products and services to the market. It covers partial operation costs of the seven regionally based Technology Transfer Offices (TTOs) affiliated with the research institutions.</p>	(+) Norway has undertaken a variety of activities promoting knowledge transfer. An example is the launching of several research programs aimed at commercialization, innovation and co-operation between research communities and actors within the business sectors, NGOs and public sector. There has also been an increased awareness within policy development of phenomena like open innovation, digital infrastructure developments and harmonization of policies.	
Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners	<p>As outlined in Norway's national research infrastructure strategy (2013) Norway has established a national coordination of e-infrastructure investments.</p> <p>In the white paper "Digital Agenda for Norway" (2013) it is outlined how authorities will facilitate and support value creation and digital reorganisation.</p>	(+) Through current policies, programmes and other tools/measures Norway is making progress towards action.	
Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	FutureID is a three-year project (2010-2012), partially funded under the FP7 which addresses the challenges of bringing secure identities to the Internet.	(-) Policies and measures in this field seem limited.	



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## LIST OF ABBREVIATIONS

BERD Business Expenditure of Research and Development  
BIA User driven research based innovation programme  
CCS Carbon Capture and Storage  
CEER Centres for Environment-friendly Energy Research  
CESSDA Council of European Social Science Data Archives  
CO<sub>2</sub> Carbon dioxide  
CoE Centres of Excellence  
CRI Centres for research based innovation  
DIFI – Agency for Public Management and eGovernment  
EDCTP Developing Countries Clinical Trials Partnership  
EE Entrepreneurship Education  
EEA European Economic Area  
EFTA European Free Trade Association  
EIT European Institute of Technology  
EPO European Patent Office  
ERA European Research Area  
ERA NET European Research Area Network  
ERC European Research Council  
ERDF European regional development fund  
ESF European Social Funds  
ESF European Science Foundation  
ESFRI European Strategy Forum on Research Infrastructures  
EU European Union  
EU-27 European Union including the 27 member states  
FP European Framework Programme for Research and Technology Development  
FTE Full time Equivalent  
GBAORD Government Budget Appropriations or Outlays on Research and Development  
GDP Gross Domestic Product  
GERD Gross Domestic Expenditure on R&D  
GLOBVAC Global Health and Vaccine Research  
GNP Gross National Product  
GUF General University Fund  
HEI Higher education institutions  
HERD Higher Education expenditure on R&D  
ICT Information and Communication Technology  
IFE Institute for Energy Research  
IMR Institute of Marine Research  
IPR Intellectual Property Rights  
IUS Innovation Union Scoreboard  
JPI Joint Programming Initiatives  
JTIs Joint Technology Initiatives  
NCE Norwegian Centre of Excellence  
NHO Confederation of Norwegian Enterprise  
NICE Nordic Innovation Centre  
NIFU Nordic Institute for Studies in Innovation, Research and Education  
NOK Norwegian kroner  
NOKUT Norwegian Agency for Quality Assurance in Education

OECD Organisation for Economic Cooperation and Development

PCT Patent Cooperation Treaty

PNP Public private partnership

PRO Public Research Organisations

R&D Research and development

RCN Research Council of Norway

RDI Research Development and Innovation

RI Research Infrastructure

S&E Sciences and Engineering

S&T Science and technology

SF Structural Funds

SGHRM Steering Group for Human Resources and Mobility

SIVA The Industrial Development Corporation of Norway

SMEs Small Business Enterprises

TTO Technology Transfer Office

US United States of America

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